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EVALUATION OF DOW CHEMICAL PRODUCTION EXTRUDED TRUSS-WEB LANDIN--ETC(U)
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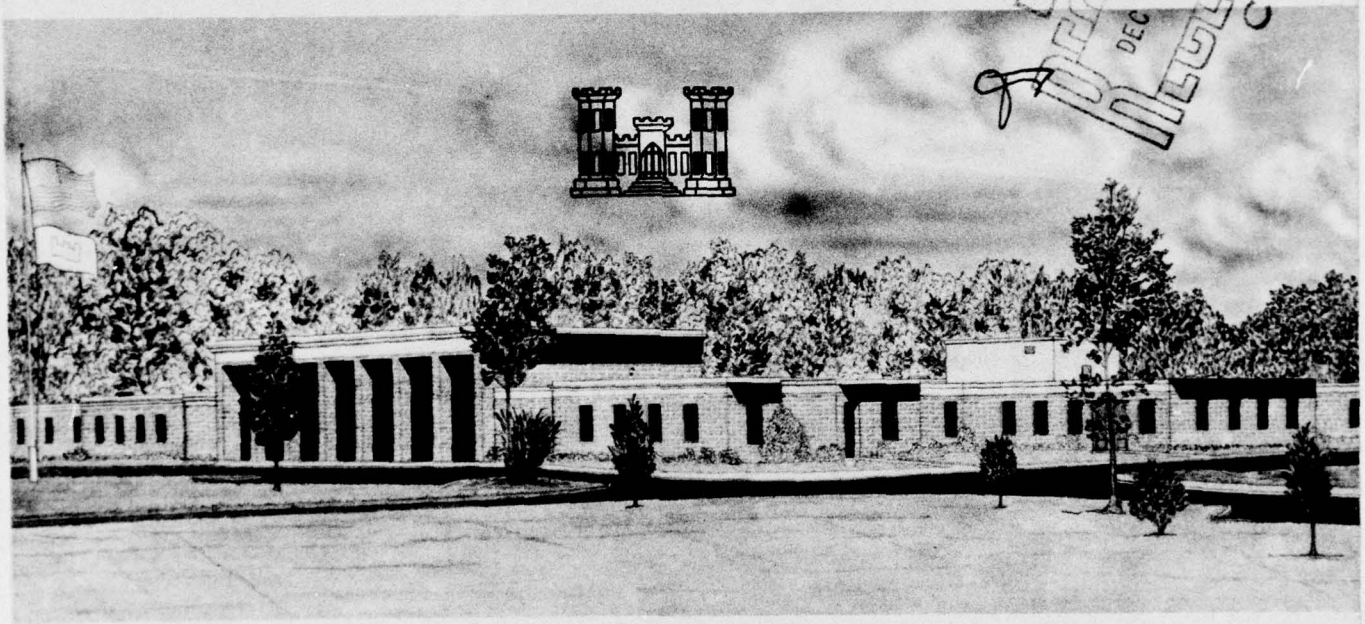
MISCELLANEOUS PAPER S-74-6

EVALUATION OF DOW CHEMICAL PRODUCTION EXTRUDED TRUSS-WEB LANDING MAT

by

D. W. White, Jr.



March 1974

Sponsored by U. S. Army Materiel Command

Conducted by U. S. Army Engineer Waterways Experiment Station
Soils and Pavements Laboratory
Vicksburg, Mississippi

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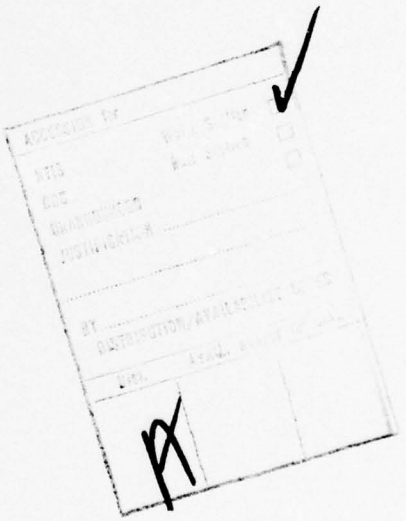

March 1974

Sponsored by U. S. Army Materiel Command
Project No. 1G764717DH01-10

Conducted by U. S. Army Engineer Waterways Experiment Station
Soils and Pavements Laboratory
Vicksburg, Mississippi

FOREWORD

This report describes accelerated traffic tests conducted on production quantities of 2- by 9-ft truss-web heavy-duty landing mat. This mat, manufactured by the Dow Chemical Company under contract for 110,160 sq ft, was procured for expanded service tests (EXST) at Dyess AFB, Texas. This test was part of the work authorized by the Surface Systems Division, Directorate of Research, Development and Engineering, U. S. Army Materiel Command, under the title "Landing Mat," Project No. 1G764717DH01-10. The traffic tests pertinent to this investigation were performed at the U. S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Mississippi, during November and December 1972 (initial production tests) and January and February 1973 (modified production tests) under the general supervision of Mr. J. P. Sale, Chief, Soils and Pavements Laboratory (S&PL). Engineers of the Materiel Development Division, S&PL, who were actively engaged in the planning, testing, analyzing, and reporting phases of this investigation under the supervision of Messrs. W. L. McInnis and H. L. Green were Messrs. D. W. White, Jr., C. J. Smith, and G. L. Carr. Mr. Dave Mayo, Aberdeen Proving Ground, Maryland, observed most of the traffic tests conducted on the truss-web heavy-duty mat at WES. The Pavement Investigations Division was responsible for constructing and trafficking the test sections and also performing the necessary soils tests under the supervision of Messrs. A. H. Joseph and C. D. Burns. This report was prepared by Mr. White.

BG E. D. Peixotto, CE, and COL G. H. Hilt, CE, were Directors of WES during the investigation and preparation of this report. Mr. F. R. Brown was Technical Director.

CONVERSION FACTORS, BRITISH TO METRIC UNITS OF MEASUREMENT

British units of measurement used in this report can be converted to metric units as follows:

Multiply	By	To Obtain
inches	2.54	centimeters
feet	0.3048	meters
square inches	6.4516	square centimeters
square feet	0.092903	square meters
pounds	0.45359237	kilograms
pounds (force) per square inch	0.6894757	newtons per square centimeter
pounds (force) per square foot	47.8803	newtons per square meter
pounds (mass) per cubic foot	16.0185	kilograms per cubic meter

SUMMARY

The investigation reported herein was conducted to evaluate 2- by 9-ft, truss-web, heavy-duty landing mat supplied by the Dow Chemical Company. The mat was traffic-tested to evaluate its performance relative to the requirement that heavy-duty landing mat be capable of sustaining 1000 coverages of heavy-duty loading (50,000-lb, single-wheel load (SWL), 250-psi tire inflation pressure) when placed on a 4-CBR subgrade.

Traffic tests were conducted to determine the performance of the truss-web mat. These traffic tests were conducted on prepared subgrades, with a rolling wheel load simulating actual aircraft conditions. A 50,000-lb SWL with a 250-psi tire inflation pressure was used. The first quantity of mat tested was designated initial production mat. This mat failed after 240 coverages due to tire hazards caused by splits which began at the female I-lock corners and extended along the female connectors. The subgrade was rated at 4.0 CBR.

Several design modifications were studied, resulting in tapering of the female connectors at the panel corners. This consisted of cutting the corners of the female connectors off for approximately 2 in. along the connector at an angle with the panel corners. The contractor modified sufficient panels with the tapered corners for a traffic test in an effort to improve the performance of the mat. This traffic test, designated modified production test, was conducted under the same loading conditions used for the initial test. In the first phase of this test, the mat was placed on a subgrade rated at 4.0 CBR and subjected to 1040 coverages without test section failure. In addition to this traffic, two additional phases of traffic were applied prior to mat test section failure. Phase 2 consisted of traffic conducted for the Aberdeen Proving Ground (APG, the agency responsible for engineering tests of heavy-duty landing mat). Since only one line of panel end joints in the standard traffic lane received 100 percent of the traffic coverages, APG requested that an additional line of panel end joints be subjected to 100 percent traffic coverage. Therefore, traffic was applied to achieve 1000 coverages on an additional line of panel end joints, and the mat successfully sustained these coverages on a subgrade rated at 4.0 CBR. Phase 3 traffic was a continuation of Phase 1 traffic until mat failure. A total of 300 additional coverages were applied to the mat on a subgrade with a CBR of 3.9 (equivalent to

336 coverages on a subgrade rated at 4.0 CBR). Therefore, it was determined that the mat will withstand 1376 coverages when placed on a 4-CBR subgrade (1040 plus 336 coverages).

Skid tests conducted on this mat resulted in values for the coefficient of friction on wet (0.40) and dry (0.62) surfaces that meet the requirements of the revised Qualitative Materiel Requirement (runway condition reading of 13-25 or coefficient of friction of 0.40 to 0.80).

Laboratory tensile tests conducted on samples taken from the mat panels revealed that the tensile strength of the material was within specified requirements.

EVALUATION OF DOW CHEMICAL PRODUCTION EXTRUDED TRUSS-WEB LANDING MAT

Introduction

1. During the periods November-December 1972 and January-February 1973, traffic tests were conducted at the Waterways Experiment Station (WES) on initial production and modified production 2- by 9-ft* truss web heavy-duty landing mat, respectively. This mat which weighs 6.4 lb per sq ft of placing area including antiskid compound was supplied by the Dow Chemical Company under a contract with the WES.

2. The tests described herein were conducted to evaluate the performance of the truss web mat when tested under criteria specified in the contract (sustain 1000 coverages, applied in the standard traffic pattern, of a 50,000-lb single-wheel load (SWL), 250-psi tire-inflation pressure, when placed on a 4-CBR subgrade) and when tested as specified in APG letter dated 28 September 1972, subject: Request for Support of Wheel Load Coverage Subtest of TECOM Project No. 7-ES-285-MAT-006 (Incl 1). The distribution of traffic is the only difference between the type test required by APG and that used by the WES. APG requested that 100 percent of the traffic coverages be applied over the entire traffic lane. The distribution used in the WES test is the 20, 80, and 100 percent distribution (standard traffic pattern). This method was used for acceptance of the truss web mat in the EDT. The 20, 80, and 100 percent coverage traffic pattern was used to determine acceptance or rejection of the mat for payment. Once this traffic was completed, WES was to apply additional traffic on the 20 and 80 percent coverage areas and bring these up to 100 percent coverage. However, in a meeting at the WES on 9 February 1973 (Incl 2) with representatives from WES, TECOM, APG, and USAARENBD, it was agreed to square off only one side of the test section with additional traffic to achieve 100 percent coverages.

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* A table of factors for converting British units of measurement to metric units is presented immediately after the Foreword.

Initial Production Test

3. Typical initial production panels are shown on Incl 3, and a juncture of three panels is shown on Incl 4. The layout of panels in the test section is shown on Incl 5. The subgrade was processed to a depth of 24 in. and prepared with an in-place CBR of 3.8 (Incl 6). T16 membrane was placed on the subgrade prior to mat placement to help prevent the subgrade from drying and causing the CBR to rise. The mat was placed at an average placing rate of 380 sq ft per man-hour with a seven-man crew. Some of the locking bars had to be tapped into the bar slots. Two half panels (panels 4a and 9a, see Incl 5) were also subjected to traffic in order to check their performance.

4. The traffic tests were conducted with a 50,000-lb SWL (Incl 7) using a 56X16, 32-ply tire with a 250-psi tire-inflation pressure. Traffic was applied in accordance with the standard 20, 80, and 100 percent coverage pattern as shown on Incl 8. No additional traffic was applied in this test to the 20 and 80 percent traffic areas since the mat failed prior to sustaining 1000 coverages of the standard traffic.

5. Prior to the application of traffic, the mat surface was generally smooth (Incl 9). Panels 24, 26, 27, and 29 shown on Incl 10 are panels which WES furnished APG for weld inspection and which were returned for testing in accordance with Incl 1. Curl at the end joints (Incl 11) was noted immediately during the application of the load cart on the mat for 0 coverage data. After 15 coverages, all panels in the traffic lane contained curls at the female I-lock corners of the end joints. Hairline cracks were noted in some of the panels in the flange of the female connector at the corners. The curls and cracks grew as the coverages were applied. Inclosures 12 and 13 show the typical condition of panels at the end of 100 coverages. Traffic was continued to 240 coverages (Incl 14) at which time the section was considered failed due to tire hazards caused by splits occurring at the female corners of the mat panels. No weld failures were noted in any of the panels. Inclosures 15-17 show the condition of typical failed panels at the end of traffic. The half panels also were curled at the female I-lock corners with one end of panel 9a split from the corner for 2 in. along the female connector. There were 33 full panels that contained cracks in the female connector at the corner from hairline up to 16-1/6 in. long. No attempt was made to replace any panels since the number of panels considered to be tire hazards exceeded the allowable 10 percent replacement criterion. Inclosures 18-21 show a typical split, wear, and abrasion on the connectors of the panels at the end of traffic. These inclosures show the condition of the panels at the end joints and at

the center of panels where two end joints came together. Subgrade data taken at the end of the test (240 coverages) are given on Incl 6. It will be noted that the CBR at the end of the test was 4.2, thus giving a rated CBR of 4.0 for the test.

6. Laboratory tests were conducted on tensile specimens of the initial production truss web mat. The average ultimate tensile strength obtained was 45,350 psi. The average ultimate tensile strength obtained for specimens of the EDT truss web mat was 44,044 psi. The specified minimum is 38,000 psi. Results of WES laboratory testing indicated no abnormalities in specified requirements for 6061-T6 alloy.

Test of Proposed Modifications

7. In discussion with a Dow representative on 7 December 1972 (see MFR dated 12 December 1972, Incl 22), it was concluded that modification to the corners should eliminate the curling and splitting along the female connector. Several methods were discussed and it was decided to try four changes. One end of the panels selected for test of the four types of modification did not receive any traffic from the load cart during the preceding test (see Incl 5). These ends were outside of the traffic lane. The other panels used to fill in the test section were also from the preceding test and had been subjected to traffic. Two pairs of panels (panels 33, 38, 40, and 45) were drilled with a 3/16-in. bit at the female corners (Incl 23). These holes were centered 1-3/4 in. from the vertical face of the I-lock connector and 1/2 in. from the edge of the female edge. Two pairs of panels were tapered at the female corner (panels 10a, 15, 18, and 31) as shown on Incl 24. This taper extended for 2 in. with the measurement being made from the vertical face of the I-lock connector. A pair of panels (panels 5 and 23) were routed at the corners to provide a smooth 1/4-in. radius between the flange of the female connector and the top surface of the panel (Incl 25). The other pair of panels (panels 20 and 28) were routed at the corners to provide a smooth 1/2-in. radius between the flange of the female connector and the top surface of the panel (Incl 26). A layout of the location of these panels in the test section is given on Incl 27.

8. Channelized traffic with the same load used in the preceding test was applied on two lanes as shown on the layout. Subgrade data are shown on Incl 6. The first pair of panels (panels 33 and 40) with drilled holes were considered failed due to a tire hazard after 100 coverages due to a split along each female connector. The second pair of panels with drilled holes (panels 38 and 45) are shown on Incl 28 after

363 coverages of traffic. Both panels were considered failed after 500 coverages due to the splits along the female connector which were tire hazards. The female corners of panels 5 and 23, with 1/4-in. radii, are shown on Incl 29 after 363 channelized coverages. These panels were failed due to splits which were a tire hazard. The female corners of panels 20 and 28, with 1/2-in. radii, are shown on Incl 30 after 363 coverages. Panel 28 contained a split along the female lip and was a tire hazard. Panel 20 was failed after 690 coverages due to a split along the female lip. The end joint of panels 10a and 31 and panels 15 and 18 are shown on Incls 31 and 32, respectively, after 804 channelized coverages. These panels were not failed when traffic was discontinued at this point. The splits along the lips of panels 5, 20, 23, 28, 33, 38, 40, and 45 were cut off after they were tire hazards so traffic could continue on panels 10a, 15, 18, and 31. Subgrade data are given on Incl 6.

Modified Production Test

9. In a discussion with a Dow representative on 18 December 1972 (see MFR dated 21 December 1972, Incl 33), it was brought out that the 2-in. tapered female corner was apparently the modification that would eliminate the panel failure at the corners. Dow agreed to modify enough panels to be used in conducting an additional traffic test to check the tapered corner modification. If this method proved satisfactory, the remainder of the mat furnished under the contract would be modified accordingly.

10. The corner of a modified panel is shown on Incl 34, and a juncture of three modified panels is shown on Incl 35. The layout of the section for the modified production truss web mat test is shown on Incl 36. The subgrade was processed to a depth of 24 in. and prepared with an in-place CBR of 3.9 (Incl 37). T16 membrane was placed on the subgrade prior to mat placement to help prevent the subgrade from drying and causing the CBR to rise.

Standard traffic pattern, Phase 1

11. The test section prior to traffic is shown on Incl 38. This traffic was applied in the standard pattern and was designated Phase 1. After 90 coverages of traffic, a slight curl was noted in the panels with end joints at the center line of the test section. The test section after 160 coverages of traffic is shown on Incl 39. Typical end joints are

shown on Incl 40. After 310 coverages (Incl 41), four panels had small areas on them where the antiskid had flaked off. There was no noticeable change in the amount of curl; however, the male connectors adjacent to the end joint of two panels were wearing due to the action of the female connectors on the male connector under the load cart. As noted on Incl 41, the mat had shifted and the traffic lanes were misaligned. The weights on the mat edges were removed and the panels were realigned in the traffic lanes.

12. An overall view of the test section after 500 coverages is shown on Incl 42. The curl at the female corners of the panels had increased slightly (Incl 43). The increase in the curl on panel 16 caused the antiskid to flake from along the edge of the female connector. Several areas on the panels were bare of antiskid (Incl 44). This is attributed primarily to the spinning action of the drive wheels of the load cart prime mover. Between 400 and 500 coverages, a misty rain fell and due to relatively high wind, this rain was blown onto the mat test section (although the mat was located under a hangar). The mat surface therefore was wet and this caused the load cart prime mover to intermittently spin on the test section. As a result of the spinning and action of the load wheel on the mat, some antiskid flaked off.

13. Traffic continued and the curl increased at the female corner of the panel end joints. Panels 16 and 17 after 760 coverages are shown on Incl 45. Panels 21, 31, and 32 contained splits along the female connector (Incls 46 and 47). Small cracks in the weld between the I-lock connector and panel extrusion at the male side of the panel were present in panels 41 and 46 after 760 coverages. After 770 coverages (Incl 48), the splits in panels 31 and 32 had become tire hazards due to the sharp edges of the split, and the sharp end of the taper at the corner had turned up. The split was 6-3/4 in. long on panel 31 and 6-1/2 in. long on panel 32. These panels were removed and CBR data taken. The CBR of the subgrade was 3.8 (Incl 37). The failed panels were replaced with new panels and traffic was continued.

14. At the end of 1040 coverages (Incl 49), CBR data were taken under panel 14 (Incl 37). The rated CBR of the subgrade through 1040 coverages (Phase 1) was 4.0. There were no other failed panels at this time. However, three panels (panels 2, 4, and 13) contained hairline cracks in the female I-lock corner weld, two panels (panels 41 and 49) contained cracks in the weld at the male I-lock corner with the longest being 5-1/2 in. (panel 41, Incl 50), and two panels (panels 21 and 36) were split along the female connector at the female I-lock corner. The split in panel 21 (Incl 51) was 5-5/8 in. The corners of half panels (panels 4a and 9a) were curled along the female connector with one end of panel 9a (Incl 52) split for 3-1/2 in. along the female connector.

100 percent traffic pattern, Phase 2

15. The panels were realigned and the traffic lanes for the 100 percent traffic (designated as Phase 2) along the edge of the test section were repainted (Incl 53). Phase 2 traffic was that mentioned in paragraph 2 to be applied to the mat in order to square off one side of the test section with additional traffic to achieve 100 percent coverages. Traffic lanes 9-11 (Incls 8, 36, and 54) were the lanes selected to be brought up to 100 percent traffic coverages. Traffic also was distributed over lanes 12-14 (Incl 54) in an effort to prevent an abrupt buildup of the subgrade at the outer edge of the traffic lane which could have had a detrimental effect on the mat performance. At the end of Phase 1, traffic lanes 9 and 10 had received 832 coverages (80 percent of 1040 coverages) and lane 11 had received 208 coverages (20 percent of 1040 coverages). Therefore, in order to bring these lanes up to 100 percent coverage, lanes 9 and 10 needed 208 additional coverages and lane 11 needed 832 additional coverages. The pattern of traffic was applied so that lanes 9, 10, and 14 received 208 coverages and lanes 11-13 received 832 coverages.

16. After 100 coverages of Phase 2 traffic, panel 21 failed due to a tire hazard. Although no additional coverages had been applied on the end of the panel (end at center line of Phase 1 traffic, see Incl 36) where the failure occurred, the split had increased in length to 6 in. and the edge of the female connector had turned up, thus exposing sharp edges and the sharp end of the taper where it separated from the panel. The panel was not replaced since the load wheel did not go over the failed panel end. The section at the end of 832 coverages (Phase 2) is shown on Incl 55. Two panels (panels 4 and 8) had splits along the female connector at the corner of the panels (Incls 56 and 57, respectively). On panel 8, the weld was cracked for 1-5/8 in. from the male I-lock corner and also was split for 2 in. parallel with the male connector (Incl 58). The weld was cracked in panel 38 at the male I-lock corner (Incl 59). Splits in the female connector of panels 21 and 36 are shown on Incls 60 and 61, respectively. The length of the split in panel 21 did not increase after the first 100 coverages in Phase 2. The length of the split in panel 36 from the beginning to the end of 832 coverages (Phase 2) increased from 3-1/2 to 3-3/4 in. The end of panel 36 (see Incl 36) with the split was located in the test section in a similar position as was the end of panel 21. Neither of these panels received any additional coverages with the load cart during Phase 2 coverages in the area where these splits were located. Runs 9 and 17 (Incl 36) were slid out of the test section for CBR data pits. The rated

CBR for Phase 2 traffic at 832 coverages was 4.7 (Incl 37). However, the average CBR at this time was high (5.2), and it was necessary to reprocess the subgrade.

17. Prior to removal of the mat for the subgrade to be reprocessed, skid tests were conducted on dry and wet surfaces to determine the coefficients of friction. These tests were conducted adjacent to the east edge of the traffic lane. A skid cart with a 30,000-lb SWL and a tire-inflation pressure of 100 psi was used. Two skids each, dry and wet, were conducted. The average force required to pull the load on a dry surface was 18,600 lb and on a wet surface was 12,000 lb. Therefore, the coefficients of friction on a dry mat surface (Incl 62) was 0.62 and on a wet mat surface (Incl 63) was 0.40.

18. The subgrade was reprocessed to a CBR of 3.5 (Incl 37). The mat was replaced (Incl 64) for additional traffic in order to bring lanes 9-11 up to 1000 coverages on a rated 4-CBR subgrade. Also, panel 21 was replaced with a new panel prior to traffic after reprocessing. A summary of actual and rated coverages already applied to lanes 9-11 and additional coverages required to bring these lanes up to 1000 coverages on a rated 4-CBR subgrade are given below.

	Traffic Line*	Avg CBR	Rated CBR	Coverages			
				Actual	Additional Actual Required	Rated	Total Rated
Phase 1	9, 10	4.2	4.0	832	-	832	832
2	9, 10	5.2	4.7	208	-	122	954
2 Reprocessed	9, 10	-	3.5	-	32	46	1000
Phase 1	11	4.2	4.0	208	-	208	208
2	11	5.2	4.7	832	-	425	633
2 Reprocessed	11	-	3.5	-	210	367	1000

* See Incls 8, 36, and 54

The additional actual coverages required as shown above were applied in less than a day's trafficking. Therefore, the CBR was not rechecked at the end of Phase 2 reprocessed traffic. The traffic pattern was applied so that lanes 9, 10, and 14 received 32 actual coverages and lanes 11-13 received 210 coverages. The test section after 1000 coverages (Phase 2) is shown on Incls 65 and 66, respectively. Panel 8 was failed due to tire

hazards at the female I-lock (Incl 67) and male I-lock (Incl 68) corners. The length of the split along the female connector was 7-3/4 in. The edge of the female connector had turned up, thus exposing sharp edges and the sharp end of the taper where it separated from the panel. The end of the I-lock connector also had turned up, thus exposing the sharp edges in the weld crack. Four other panels (panels 4, 13, 28, and 38) had splits along the female connector at the corner; however, none of these were tire hazards. The longest split was in panel 4 and it was 6-1/8 in. long (Incl 69). This split was at the west end of the panel (see Incl 36). Two panels (panels 18 and 38) had short cracks in the weld at the male side of the panels.

19. A total of four panels were failed due to tire hazards as a result of splits and cracks at the panel corners at the end of all traffic through Phase 2 with the subgrade reprocessed. These panels were 31, 32, 21, and 8. Panels 31, 32, and 21 were replaced with new panels. There were a total of 40 panels subjected to 100 percent traffic coverages. Therefore, using the allowable 10 percent replacement criteria, four panels could be replaced and when an additional panel failed, the section was failed. Panel 8 remained in the section as no additional traffic would be applied on this panel.

Standard traffic pattern, Phase 3

20. Phase 3 was the designation given to additional traffic applied to lanes 1-8 by the standard pattern. A total of 1340 coverages would have to be applied during Phase 3 before any additional traffic on lanes 9 and 10 (80 percent lanes - .80 X 1340 = 1072 coverages) and 6250 coverages during Phase 3 before additional traffic on lane 11 (20 percent lane - .20 X 6250 = 1250 coverages). Lanes 9 and 10 had already received an actual total of 1072 coverages and lane 11 had received an actual total of 1250 coverages (Incl 54); therefore, no Phase 3 traffic was applied to them.

21. The test section at 0 coverage, Phase 3 traffic, is shown on Incl 70. Traffic was continued until 300 coverages were completed (Incl 71). The test section was failed at this coverage level as five additional panels (in addition to the four failed during Phases 1 and 2 traffic) were tire hazards. These panels were 2, 4, 36, 41, and 47, and failure resulted from tire hazards due to splits and sharp edges exposed to the tire. The splits and weld cracks in panels 2, 4, 36, and 41 are shown on Incls 72-76, respectively. Panel 47 was split along the female connector similar to panel 2 (Incl 72). Several panels had areas where the antiskid

material had come off. Inclosure 77 shows the condition of the antiskid on panels 12, 14, 16, and 17 at the end of testing. In comparison with Incl 44, the majority of the antiskid material that came off these panels did so in the first 500 coverages of Phase 1. Several other panels had small areas where the antiskid had flaked off due to the load wheel and the action of the drive wheels of the load cart'prime mover.

22. Soil data were taken at the end of 300 coverages, Phase 3 (Incl 37). The average CBR of the subgrade was 4.2 with a rated CBR of 3.9. Thus, 300 coverages on subgrade with a rated CBR of 3.9 is equivalent to 336 coverages on a subgrade with a 4.0 CBR. The panels were inspected after they were removed from the test section. Inclosure 78 shows a typical failed panel at the female I-lock corner due to a split in the female connector. Three panels were split in the male connector as shown on Incl 79. Inclosure 80 shows the split in the rib nearest the female connector of panel 2. Inclosure 81 shows a split in the bottom surface of panel 2. These splits occurred adjacent to the end joint of half panel 9a and full panel 10a (Incl 36). Two other panels (panels 24 and 44) had splits in the rib nearest the female connector at the center of the panels. The splits in the male and female connectors mentioned above were not visible from the top surface of the mat nor was there separation between these panels that presented a tire hazard as the load cart passed over them.

Results

23. The results of tests on the initial production and modified production truss web mat are as follows:

Initial production truss web mat

a. The mat sustained only 240 of the required 1000 coverages of the 50,000-lb SWL with a 250-psi tire-inflation pressure on a 4-CBR subgrade prior to failure of the mat due to splits along the female connectors at the panel corners.

Modified production truss web mat

b. Standard traffic pattern, Phase 1. The mat sustained 1040 coverages of the 50,000-lb SWL with a 250-psi tire-inflation pressure on a 4-CBR subgrade with only two panel failures (panels 31 and 32) due to tire hazards.

c. 100 percent traffic pattern, Phase 2. The mat sustained 1000 coverages (100 percent traffic as requested by APG) of the 50,000-lb SWL with a 250-psi tire-inflation pressure on a 4-CBR subgrade with only four panel failures (panels 31, 32, 21, and 8) due to tire hazards.

d. Standard traffic pattern, Phase 3. In addition to the traffic sustained by the mat under Phases 1 and 2, the mat sustained an additional 300 coverages of the 50,000-lb SWL with a 250-psi tire-inflation pressure on a 3.9-CBR subgrade (equivalent to 336 coverages on a 4-CBR subgrade) prior to exceeding the 10 percent allowable mat replacement criteria of failed panels. Therefore, the rated coverages (standard traffic pattern) on a 4-CBR subgrade for the modified production truss web mat is 1376 coverages (1040 and 336, respectively). Inclosure 82 shows the rated coverages at the end of the mat test.

e. Skid tests. The coefficient of friction on wet (0.40) and dry (0.62) surfaces meets the requirements of the revised QMR (RCR of 13-25 or coefficient of friction of 0.40 to 0.80).

f. Tensile strength test. The ultimate tensile strength of the material used to fabricate the mat met the requirements of the specification.

Dewey W. White, Jr.

82 Incl*
as

DEWEY W. WHITE, JR.
Engineer
Landing Mat Branch

CF w/incl:
AMC, ATTN: AMCRD-GM (Mr. R. G. Marshall)
HQDA (DAEN-MER-D/Mr. Paul F. Carlton)
HQDA (DAEN-MER-M/Mr. G. R. Kozan)
TECOM, ATTN: AMSTE-GE (LTC R. W. Auth)
MERDC, ATTN: SMEFB-MKB (Mr. Marvin E. Wilkins)
APG, ATTN: STEAP-MT-F (Mr. Don Morris)
USAARENBD, ATTN: STEBB-TD-E (CPT John K. Brand)

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* Inclosures 83-88 have been added as additional information for the reader. These include deflection (incls 83 and 84), cross-section (incls 85 and 86), and profile (incls 87 and 88) level data for the initial and modified production mat tests.

DEPARTMENT OF THE ARMY
ABERDEEN PROVING GROUND
ABERDEEN PROVING GROUND, MARYLAND 21005

Mr. Morris/sjk/870-3846

23 SEP 1972

STEAP-MT-F

SUBJECT: Request for Support of Wheel Load Coverage Subtest of TECOM Project No. 7-ES-285-MAT-006

Director
US Army Waterways Experiment Station
ATTN: Mr. Hugh Green
PO Box 631
Vicksburg, Mississippi 39180

1. References:

a. Plan of Test of Prefabricated Aluminum Landing Mat (Heavy Duty) for Engineering Test, TECOM Project No. 7-ES-285-MAT-006, APG, Aberdeen Proving Ground, Maryland, June 1972.

b. FONECON between Messrs. D. White, USAWES, and D. Morris, APG, subject: Cost Estimate for Conducting 1000 Wheel Load Coverages Using a 100% Coverage Lane of 132-Inches, 20 September 1972.

c. FONECON between Messrs. G. Daneker, HQ, TECOM, and D. Morris, APG, subject: Project Funding and USAWES Support to APG, 21 September 1972.

2. As per reference 1b, request your Agency provide support to APG to conduct a wheel load coverage test at Waterways Experiment Station. Testing to be conducted must be as follows:

a. The coverage test must consist of 1000 single-wheel load coverages with a 250 psi pressure on the tire (200 square-inch contact area, nominal).

b. The traffic lane must be 132 inches wide and the coverages must be distributed uniformly over 100 percent of the width. This width will give an additional 12 inches of loading on both ends of the 108-inch long panel in the center of the traffic lane for cross-influence loading factors. A diagram of the test traffic lane and number of test panels is included in Inclosure 1.

Incl 1

STEAP-MT-F 28 SEP 1972

SUBJECT: Request for Support of Wheel Load Coverage Subtest of TECOM Project No. 7-ES-285-MAT-006

c. The soil must be maintained as close as possible to the required 4 CBR level.

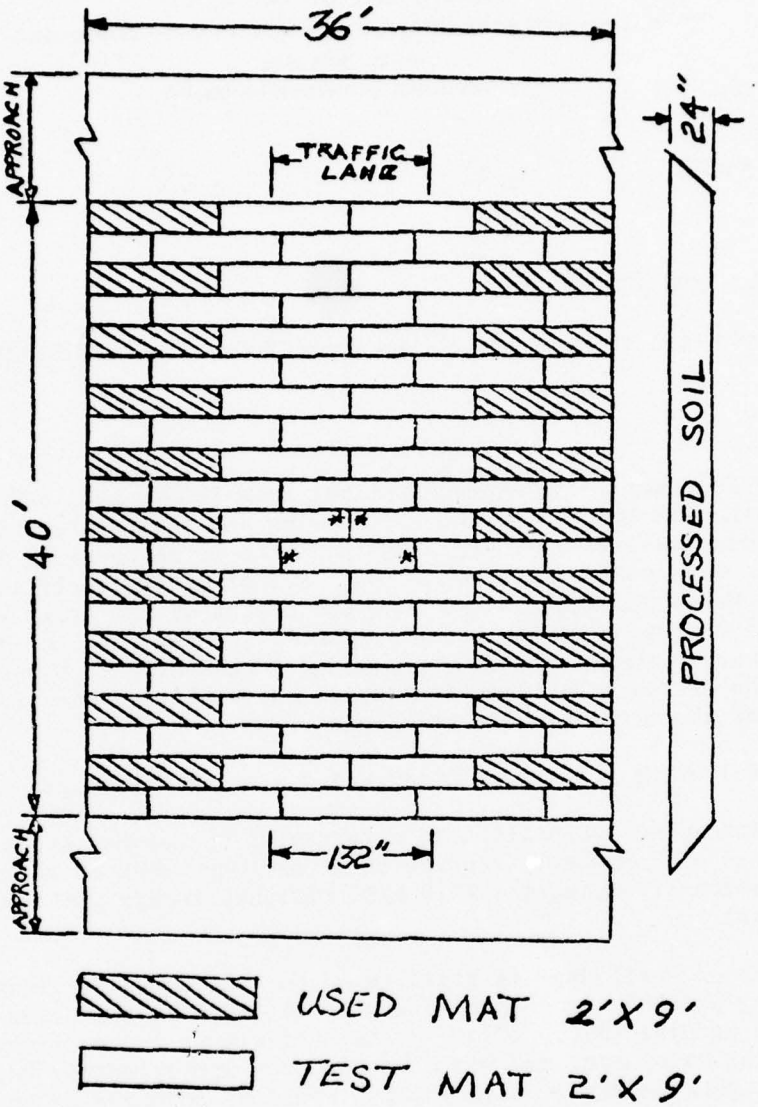
d. The welded end joints as indicated by asterisks on Inclosure 1 will be radiographically inspected prior to shipment to your Agency and again upon return to APG.

3. Total project funds requested to conduct the test referenced in paragraph 1a is $57,000 of which $32,000 is required to support testing to be conducted at APG and $25,000 is to be retained by USAWES to conduct the wheel load subtest.

R. P. Witt

1 Incl
as

R. P. WITT
Associate Director
Materiel Testing Directorate



Incl 1 to Incl 1

DEPARTMENT OF THE ARMY
WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS
P. O. BOX 631
VICKSBURG, MISSISSIPPI 39180

IN REPLY REFER TO: WESSS

9 February 1973

MEMORANDUM FOR RECORD

SUBJECT: Visit of Representatives from TECOM, APG, and USAARENBD

1. On 7 February 1973, representatives from TECOM, APG, and USAARENBD visited the WES to discuss the forthcoming EST of the truss web landing mat and dust palliatives. This MFR pertains to discussions in connection with the landing mat test items. A list of attendees is given on Incl 1. Mr. W. L. McInnis reviewed the status of the truss web traffic tests which were currently being conducted in Hangar 4, and Mr. C. D. Burns reviewed the status of the plans for returning to Dyess AFB for resumption of the rehabilitation work. The visitors observed traffic testing of the truss web mat at Hangar 4.

2. The following items were discussed during the meeting:

a. The Dyess rehabilitation effort will be resumed shortly after 1 March and will probably require three or four weeks of work. In lieu of WES personnel laying the XM19 mat, military troops will be used in this effort.

b. The 1 April date is still valid for the actual initiation of mat laying and this is when military troops will be scheduled to be available at Dyess AFB. LTC R. W. Auth indicated troops probably would not be sent as a unit, and would be used for approximately two or three weeks. Approximately 30 days' notice would be required to change arrival time of the troops.

c. APG will probably need an additional $8000 to $10,000 funding in order to cover the retest of the modified truss web mat at the WES. LTC Auth will establish a firm figure and make the official request to Mr. Marshall (AMC).

d. In discussing the conduct of the mat tests in Hangar 4, it was suggested by TECOM and agreed to by the WES that we would square off one side of the test section with additional traffic to achieve 100 percent coverages in order to satisfy the official requirement of the TECOM test plan. The purpose of this would be to evaluate more connectors and to provide additional reliability data in connection with the investigation of the truss web mat.

WESSS 9 February 1973
SUBJECT: Visit of Representatives from TECOM, APG, and USAARENBD

e. WES personnel agreed that since the mat had satisfied the 1000-coverage requirement stipulated in the Dow contract, we were officially accepting the modification and would proceed to have the remainder of the mat at Dyess AFB modified by the contractor at his expense prior to acceptance, with delivery made to Dyess not later than 31 March 1973.

f. Mr. G. W. Daneker indicated that if we felt a need to test XM19 mat from the depot to determine what effect storage had on the sandwich-type design, we should make a request for O&MA funds.

Hugh L. Green

1 Incl
as

HUGH L. GREEN
Engineer
Chief, Landing Mat Branch

CF w/incl:
AMC, ATTN: AMCRD-GM (Mr. R. G. Marshall)
Mr. Cecil D. Burns

LIST OF ATTENDEES

Meeting at WES on Mat and Dust Tests
6 February 1973

U. S. Army Test and Evaluation Command

LTC Richard W. Auth
Mr. George W. Daneker

U. S. Army Armor and Engineer Board

LTC Griffen A. Marr
CPT Richard E. Bardelcik

Aberdeen Proving Ground

Mr. David S. Mayo, Test Director, Mat Test Division

U. S. Army Engineer Waterways Experiment Station

Mr. Richard G. Ahlvin, Assistant Chief, Soils and Pavements Laboratory
Mr. W. L. McInnis, Chief, Materiel Development Division
Mr. Cecil D. Burns, Chief, Field Test Branch
Mr. Hugh L. Green, Chief, Landing Mat Branch
Mr. Royce C. Eaves, Chief, Stabilization Branch
Mr. Dewey W. White, Jr., Landing Mat Branch
Mr. Gordon L. Carr, Landing Mat Branch

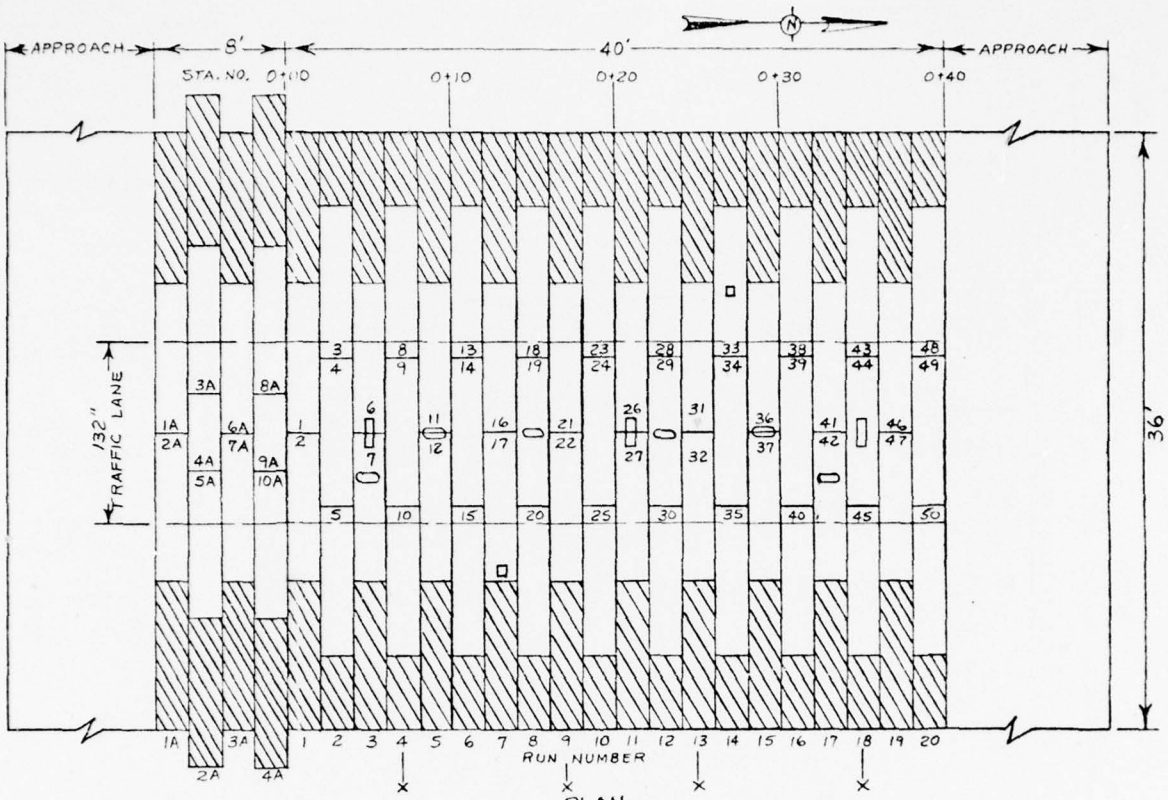
Incl 1 to Incl 2

Full and half panels of initial production truss web mat

Incl 3

Incl 4

Juncture of three panels



LEGEND

- X CROSS-SECTION DATA
- DEFLECTION DATA POINTS
- USED TRUSS WEB MAT
- COVERAGE CBR PITS
- 240 COVERAGE CBR PITS

TEST SECTION LAYOUT
INITIAL PRODUCTION TRUSS WEB
HEAVY DUTY MAT

Incl 5

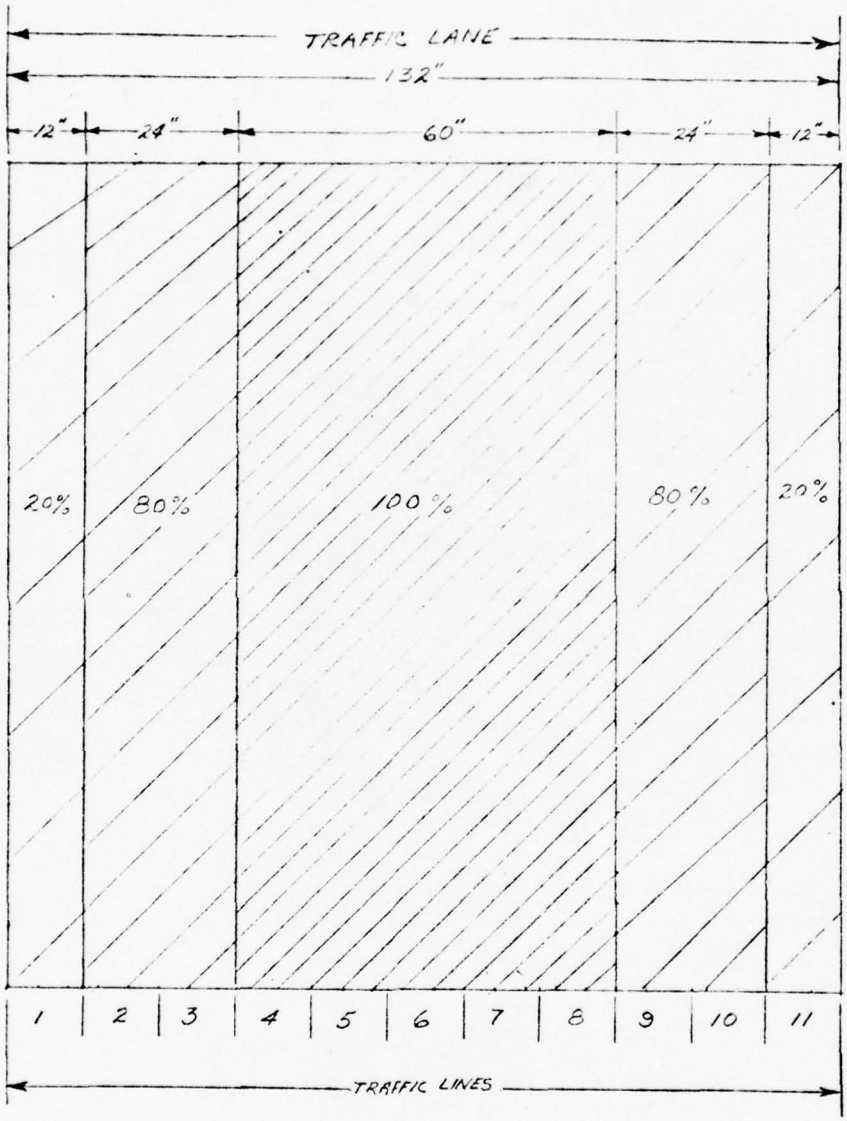
SUMMARY OF CBR, WATER CONTENT, AND DENSITY DATA

No. of Coverages	Location	Depth in.	CBR	Water Content %	Dry Density pcf	Average CBR for Coverage Level	Rated CBR
2- by 9-ft Initial Production Truss Web Mat							
0	0+13	0	3.8	31.3	86.8		
		6	3.5	31.1	87.5		
		12	3.6	30.2	86.1		
		Avg	3.6	30.9	86.8	3.8	
0	0+27	0	4.1	30.8	87.6		
		6	3.7	30.5	87.7		
		12	4.3	31.1	86.5		
		Avg	4.0	30.8	87.3		
240	0+05	0	5.0	30.2	87.7		4.0
		6	3.5	32.0	87.1		
		12	3.7	31.5	86.4		
		Avg	4.1	31.2	87.1		
240	0+21	0	3.5	32.3	87.5		
		6	3.6	32.5	86.2		
		12	3.6	32.4	88.2	4.2	
		Avg	3.6	32.4	87.3		
240	0+35	0	4.9	30.6	88.3		
		6	4.7	29.7	88.9		
		12	4.7	29.2	88.5		
		Avg	4.8	29.8	88.6		
Proposed Modified 2- by 9-ft Production Truss Web Mat							
0 (Channelized)						4.2	
804 (Channelized)	0+17 Center of Panel	0	3.6	32.8	87.3		3.9
		6	3.6	33.3	86.3		
		12	3.8	33.5	84.9		
		Avg	3.7	33.2	86.2		
	0+27 Joint of panels 5 and 23	0	3.7	33.1	87.2	3.6	
		6	3.4	33.3	86.3		
		12	3.5	33.7	85.3		
		Avg	3.5	33.4	86.3		

Incl 6

Heavy-duty load cart with 50,000-lb single-wheel load and 250-psi tire-inflation pressure

Incl 7



NOTE: EACH PASS IS EQUAL TO A COVERAGE BY A 12-IN-WIDE LOAD WHEEL OVER EACH TRAFFIC LINE.

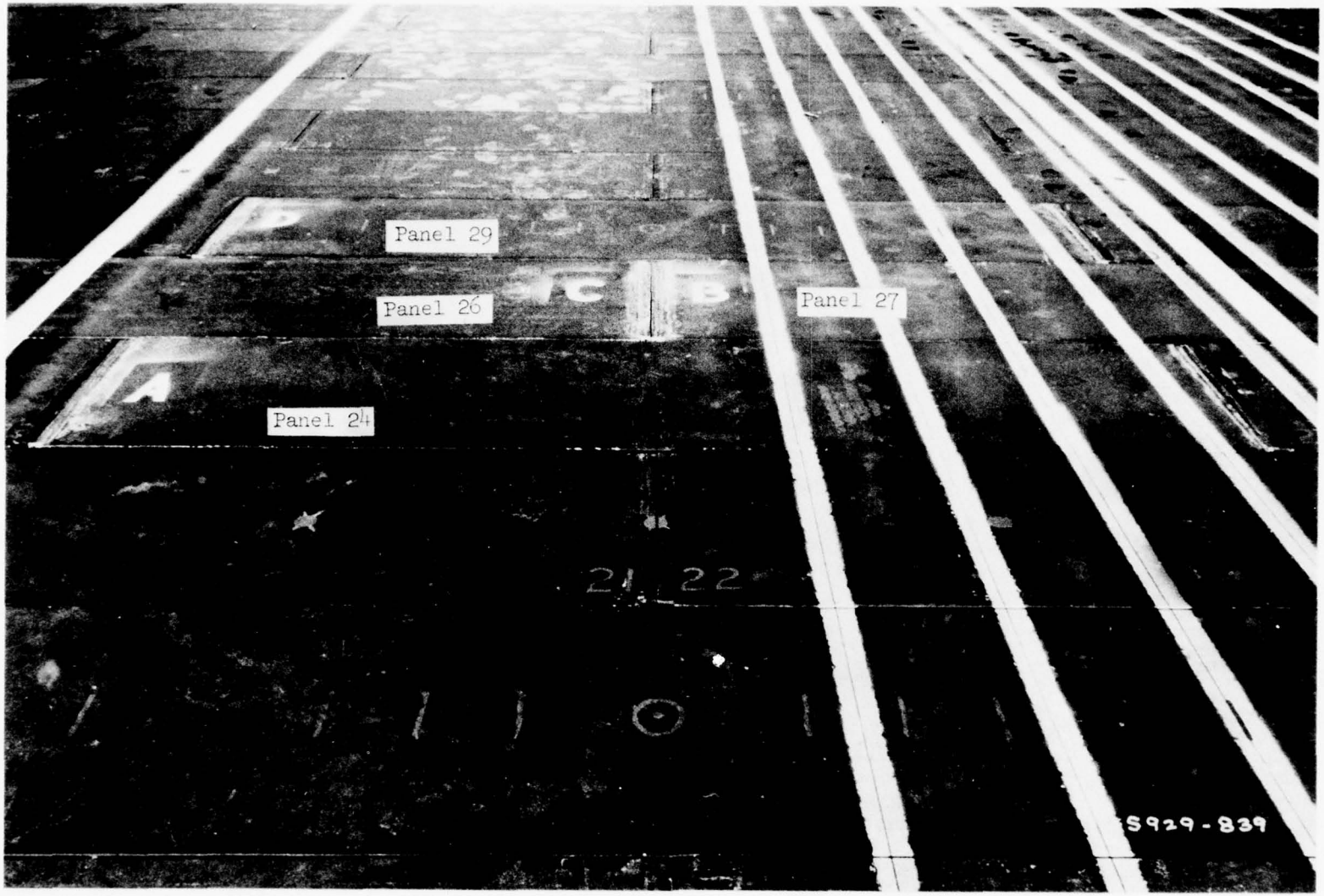
STANDARD
TRAFFIC DISTRIBUTION

Incl 8

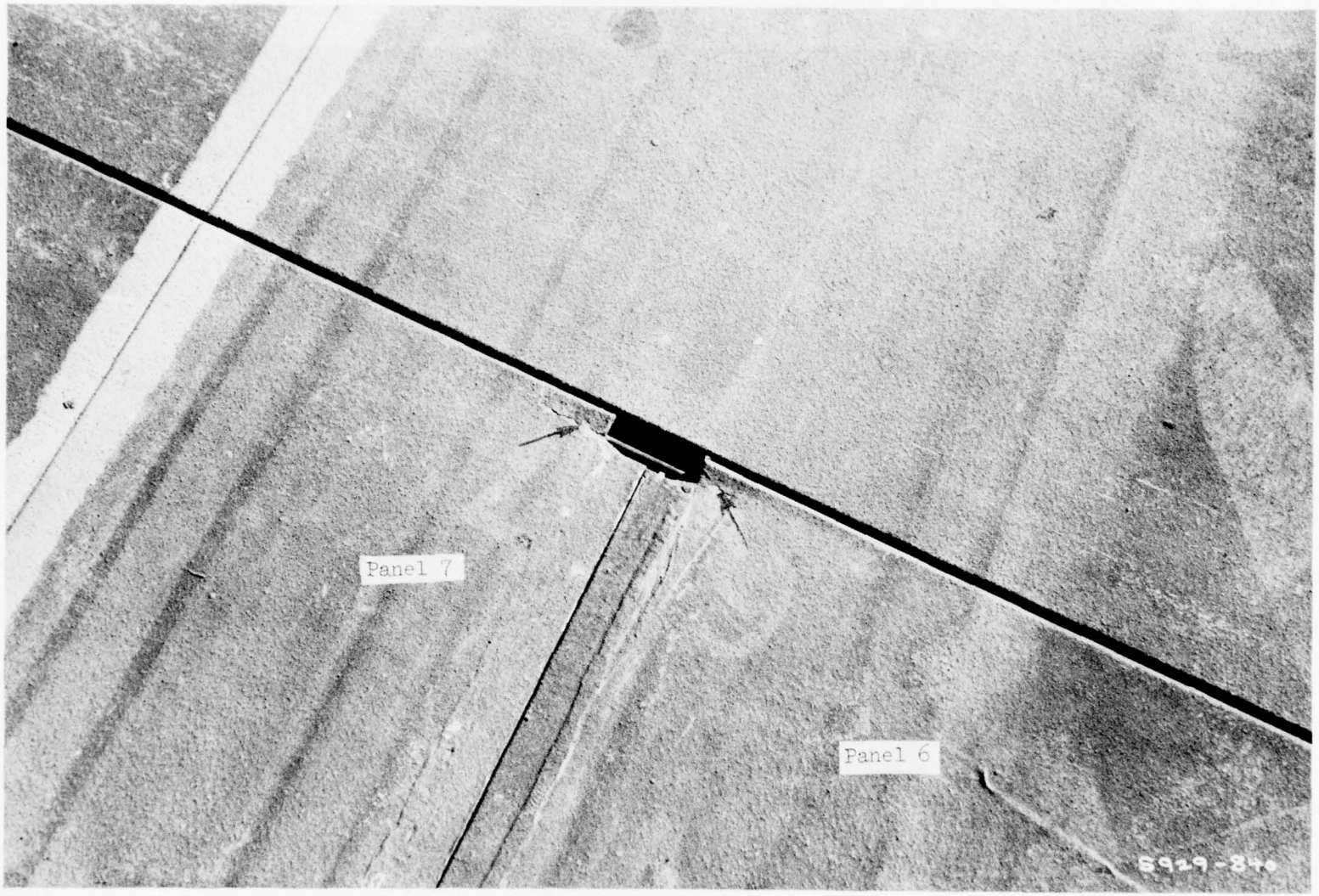
Test section prior to traffic

Incl 6

Incl 10



Panels APG inspected for weld cracks



Curl on panels 6 and 7 (note antiskid flaking at corners)

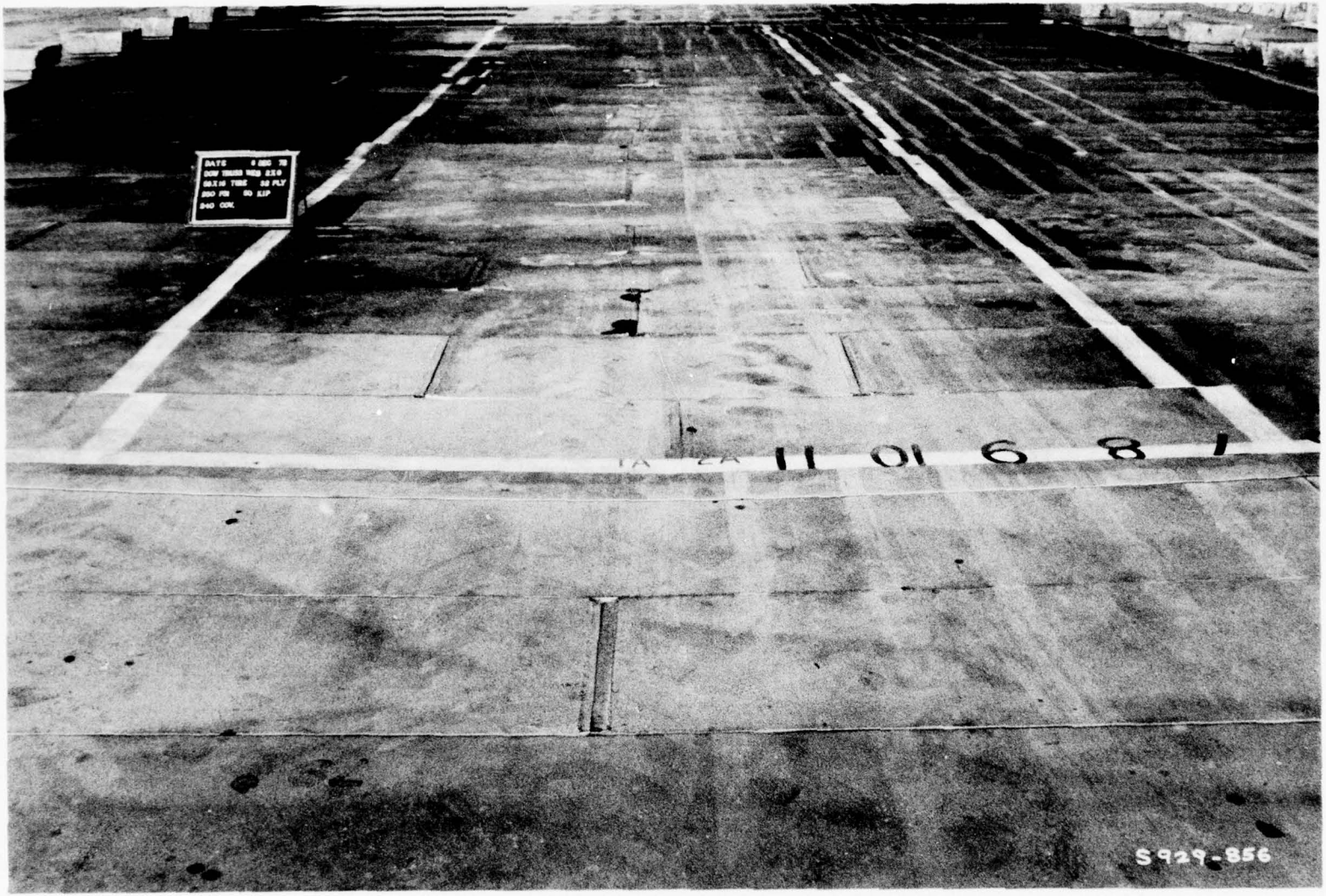
Incl 11

Panels 6 and 7 after 100 coverages

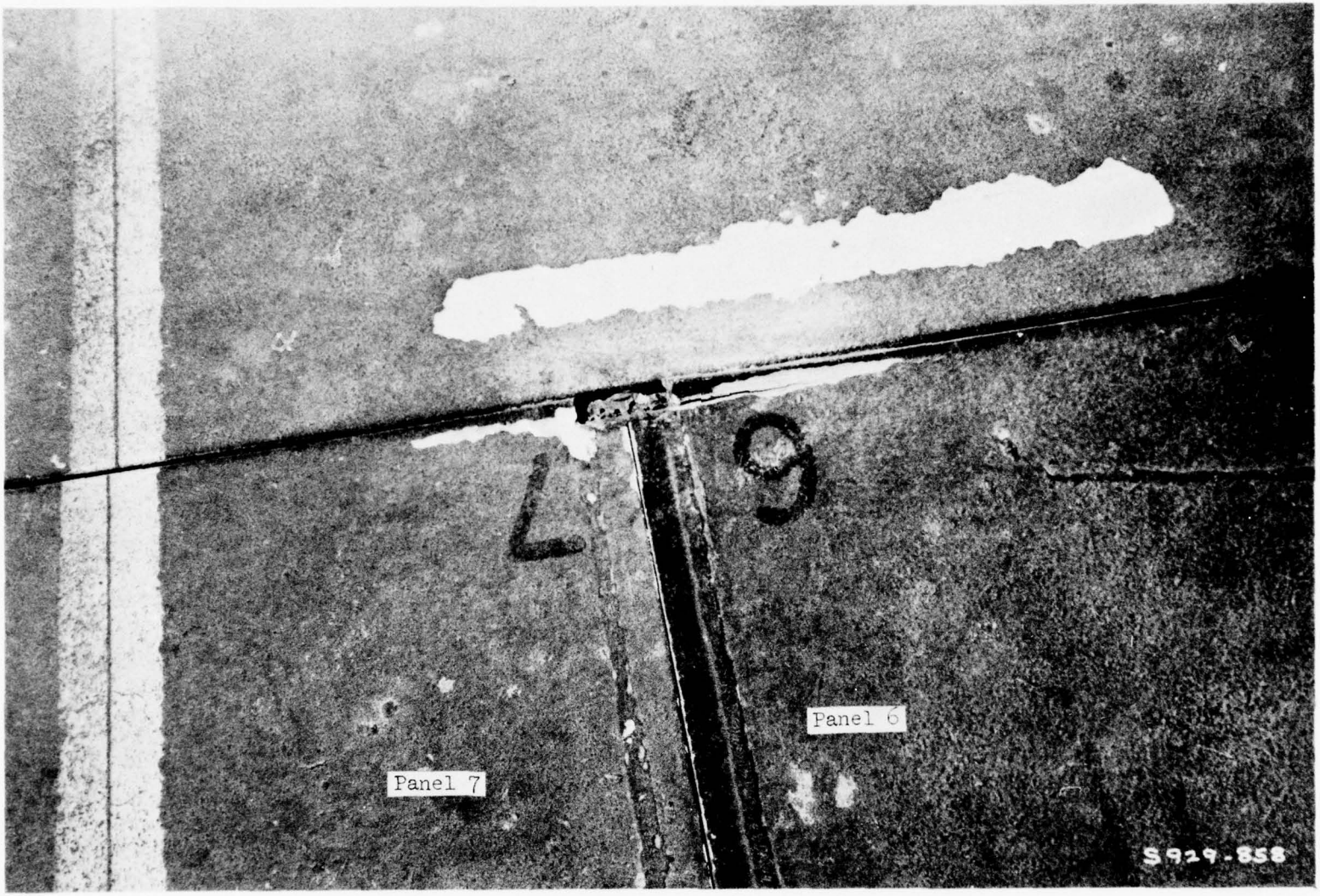
Panels 33 and 34 after 100 coverages

Incl 13

Incl 14



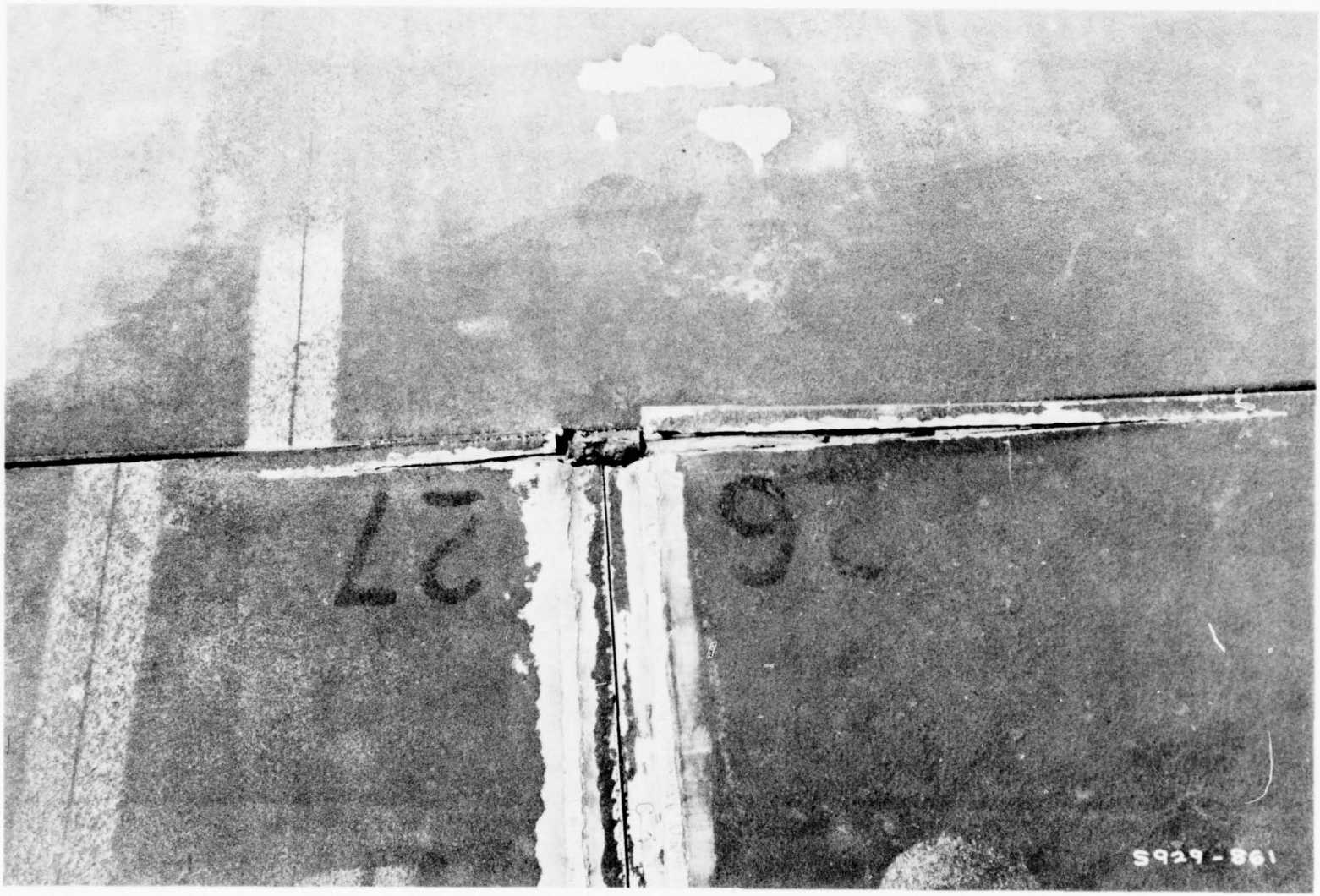
Test section after 240 coverages



Panels 6 and 7 after 240 coverages

Incl 15

Incl 16

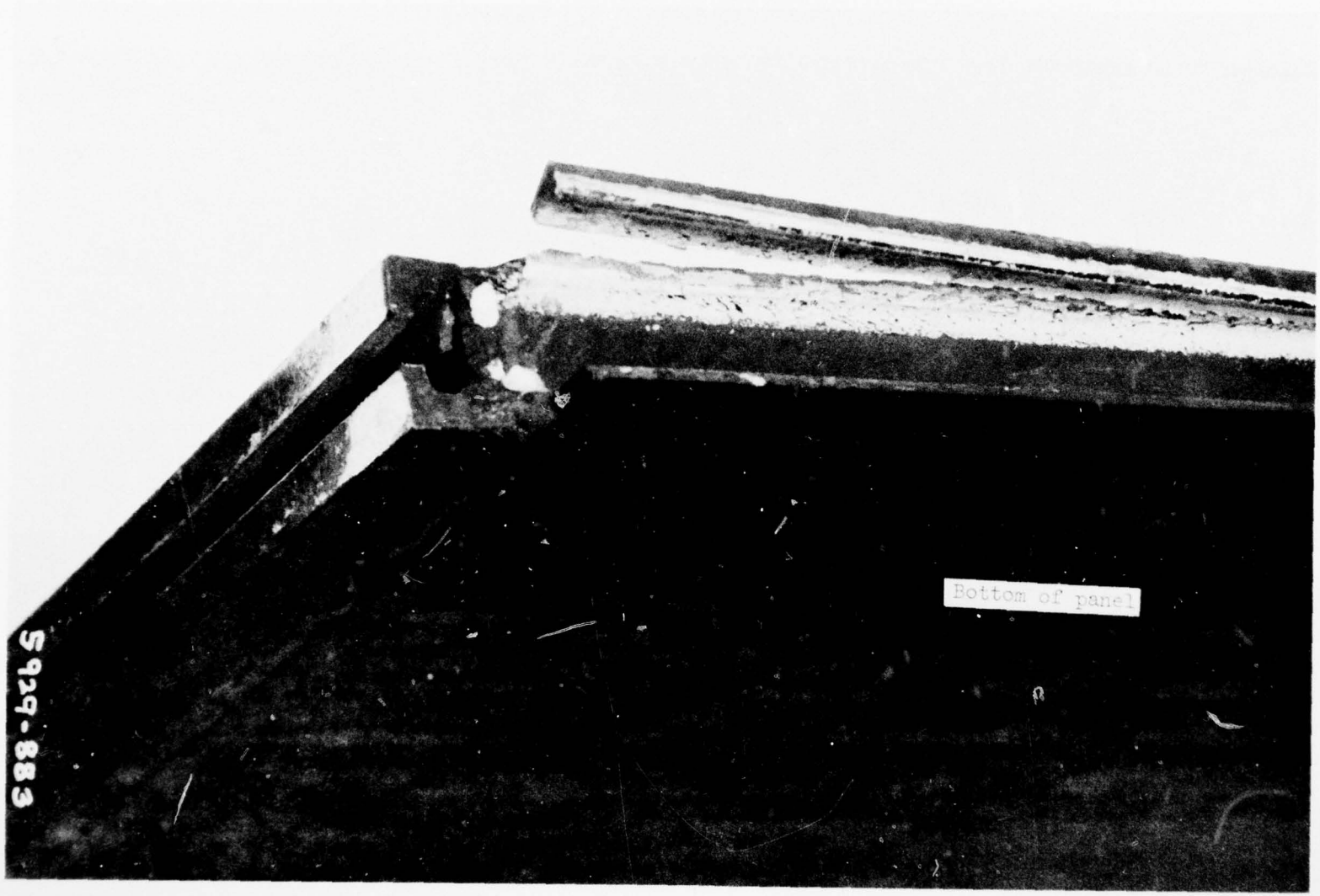


Panels 26 and 27 after 240 coverages

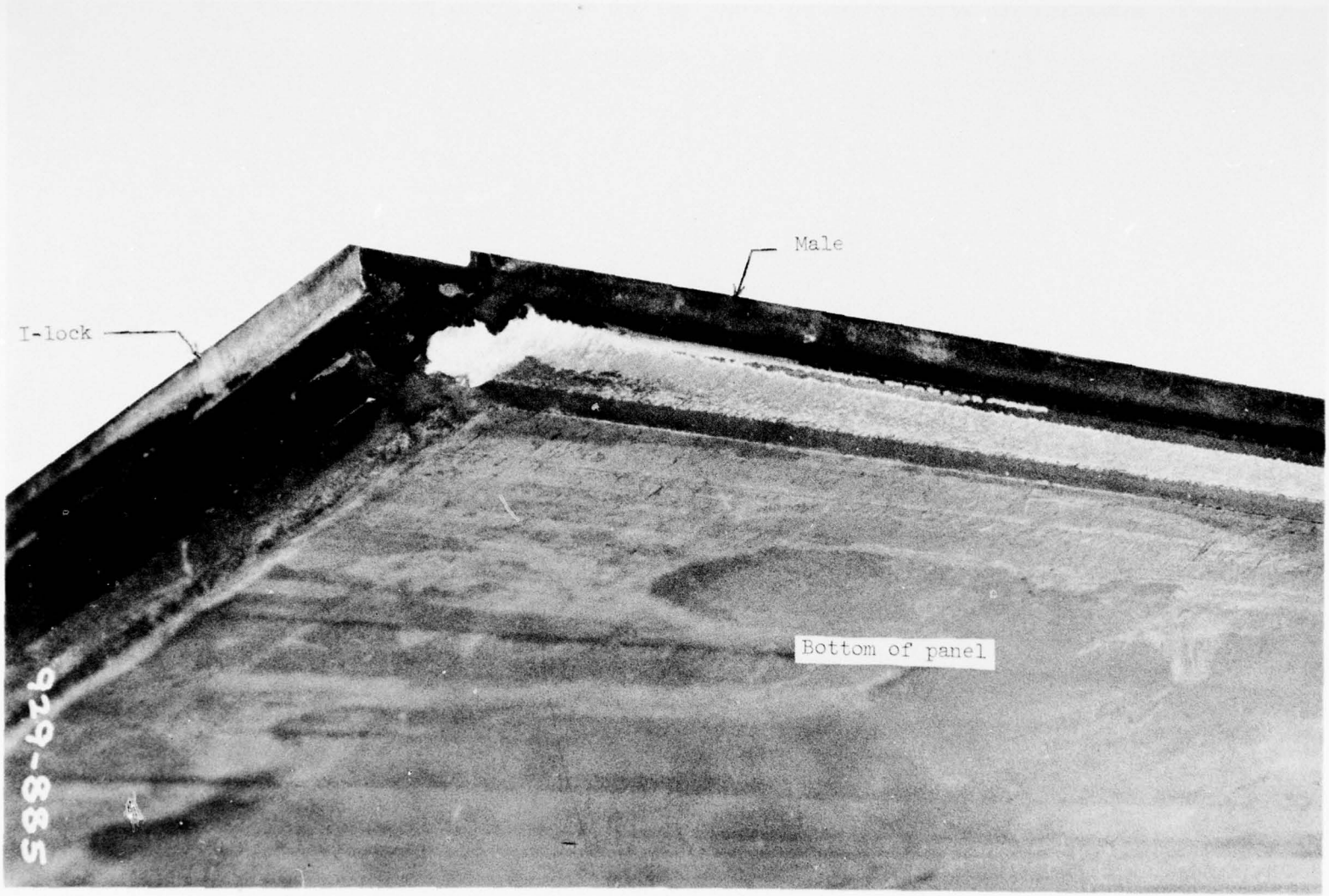
Panels 33 and 34 after 240 coverages

Incl 17

Incl 18



Split in female connector after 240 coverages

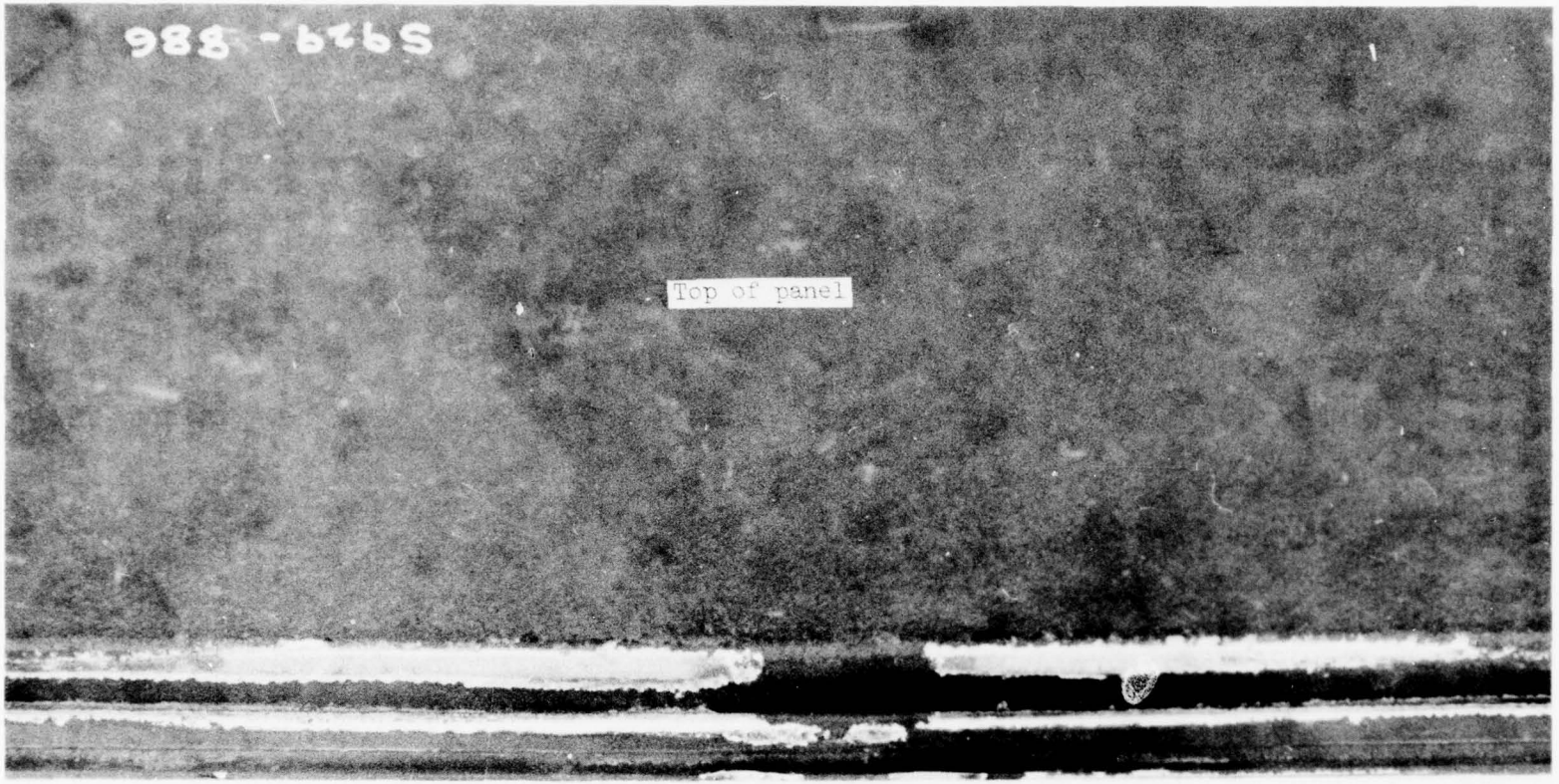


Wear and abrasion of male and I-lock connectors after 240 coverages

Incl 19

Incl 20

Wear and abrasion of female connector (at center of panel) after 240 coverages



Incl 21

Wear and abrasion of male connector (at center of panel) after 240 coverages

DEPARTMENT OF THE ARMY
WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS
P. O. BOX 631
VICKSBURG, MISSISSIPPI 39180

IN REPLY REFER TO: WESSS

12 December 1972

MEMORANDUM FOR RECORD

SUBJECT: Visit of Representatives from the Dow Chemical Company and APG to Observe EDT of Truss Web Mat

1. On 7 December 1972, representatives from the Dow Chemical Company and APG visited the Mat Section to observe traffic tests of a production quantity of Dow's heavy-duty truss web landing mat and to discuss the mat failures which were occurring. Traffic was stopped on the test section during the day after 240 coverages due to excessive mat breakage (C-rail) and tire hazards which occurred at the C-rail corners at the end joints. The following personnel met during the afternoon to discuss the problem:

Dow Chemical Company

Mr. G. Keith Glaza, Development Associate, Midland, Michigan
Mr. Fred H. Eckert, Plant Manager, Russellville, Ark.

APG

Mr. Don Morris
Mr. Dave Mayo

WES

Mr. W. L. McInnis
Mr. D. W. White
Mr. H. L. Green

2. The following items were discussed in the meeting.

a. Dow personnel indicated they could see no apparent difference in appearance of the original experimental mat and the production mat except that Mr. Glaza was concerned that at the corner weld at the C-rail, the parent metal was slightly notched and possibly contained reweld metal. Some concern was also expressed over the method the contractor used in removing excess metal at the intersection of the side and end connectors.

b. Mr. Glaza was of the opinion that the troubled area could be modified and the mats so fixed as to prevent the curl-up of the C-rail by reducing the stress concentrations which are occurring at the corners.

Incl 22

c. Possible solutions which are being considered as modifications to existing mat are machining or milling a 1/2- to 1-in. radius outside the weld-affected corner, drilling a 3/16-in. hole 1/4 in. away from the corner weld, and chamfering an angle on the top and/or the underlap lip of the C-rail. These solutions would all be directed toward changing the geometry at the corner of the C-rail and end connector.

d. Dow personnel indicated they felt the problem of the curl-up and metal crack was due to low elongation of metal in this area due to recasting of metal or welding material or a combination of both, and that a "clean-up" job on the sharp corners would eliminate the stress concentrations.

3. In conjunction with our analysis of the failure, the WES will try some of the above solutions on new mat corners and conduct concentrated traffic coverages to see what effect these modifications will have on the curl-up problem. Both Dow and APG personnel indicated they would like to have mat samples shipped to their facilities in order that they might conduct metallurgical analyses to see if there were any "freaks" which might have crept into the extrusion process.

4. In discussing the differences in the original truss web mat and the production mat, the following items were considered:

a. The original mat was fabricated on Dow's 14,000-ton press at Madison, whereas the production mat was fabricated on Dow's 8000-ton press at Russellville. The Madison press has a round billet and container, and the Russellville press has a rectangular billet and container which is designed primarily for landing mat extrusions.

b. A different billet supplier was used in the extrusion of a portion of the production mat, although all of Dow's laboratory test data indicate that there was no difference in the alloys which, incidentally, Dow has tailored for landing mat extrusions, although the material is 6061-T6 alloy.

c. ALFAB (formerly WACO), Enterprise, Ala., fabricated the initial mat, and El Campo Aluminum Company (formerly May Aluminum Company), El Campo, Texas, fabricated the production mat.

5. It was agreed that the mat at Dyess AFB still belonged to Dow since the quantity tested at the WES failed to meet the 1000-coverage requirement stipulated by the contract and plans are for Dow to develop a proposed modification which we would again hope to check out in a roll test at the WES, and if proved satisfactory and agreeable, this modification

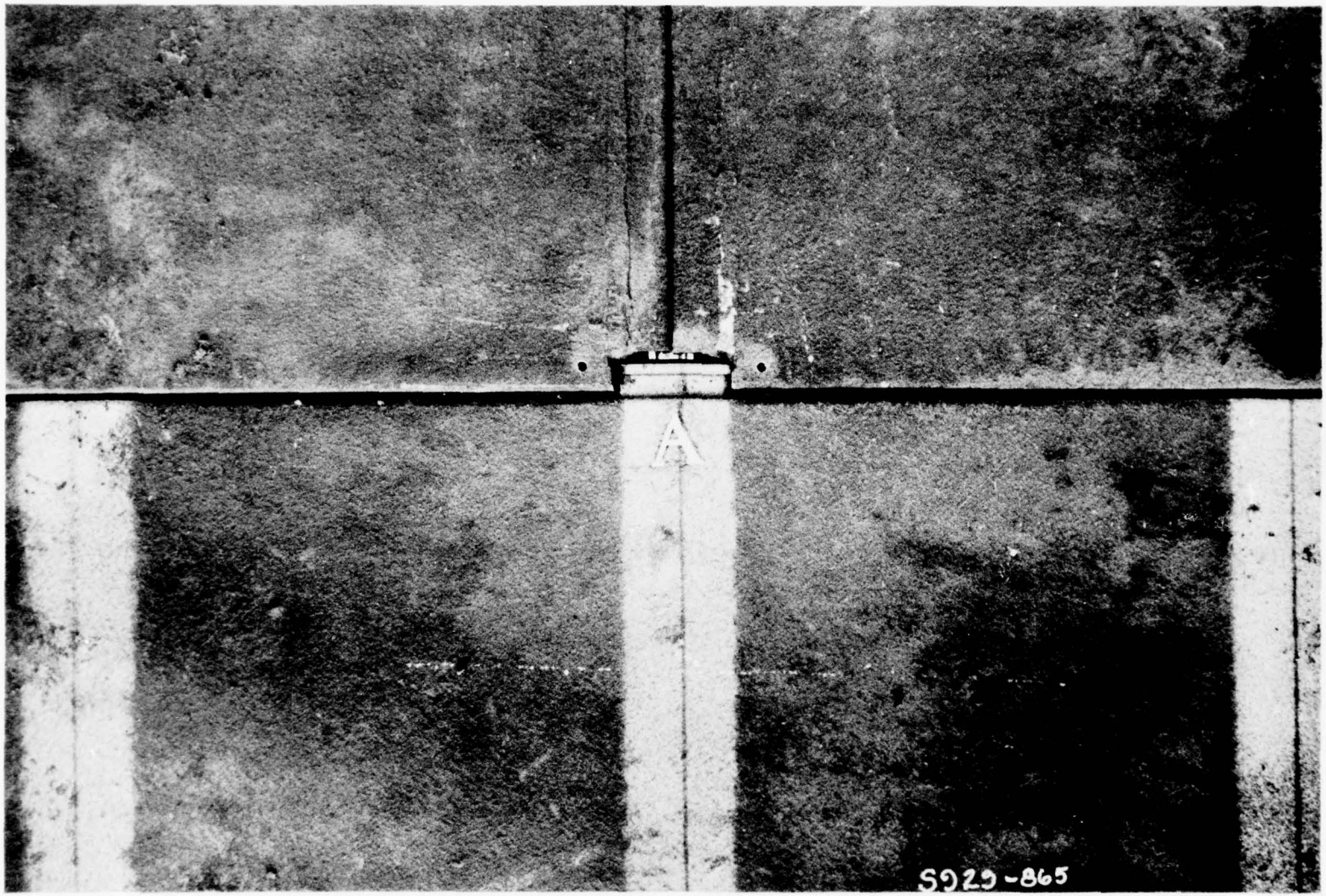
WESSS 12 December 1972

SUBJECT: Visit of Representatives from the Dow Chemical Company and APG to Observe EDT of Truss Web Mat

would be made by Dow to the production quantity at Dyess AFB. Hopefully, this could be conducted within the interim period while the rehabilitation effort is being delayed due to unfavorable weather conditions.

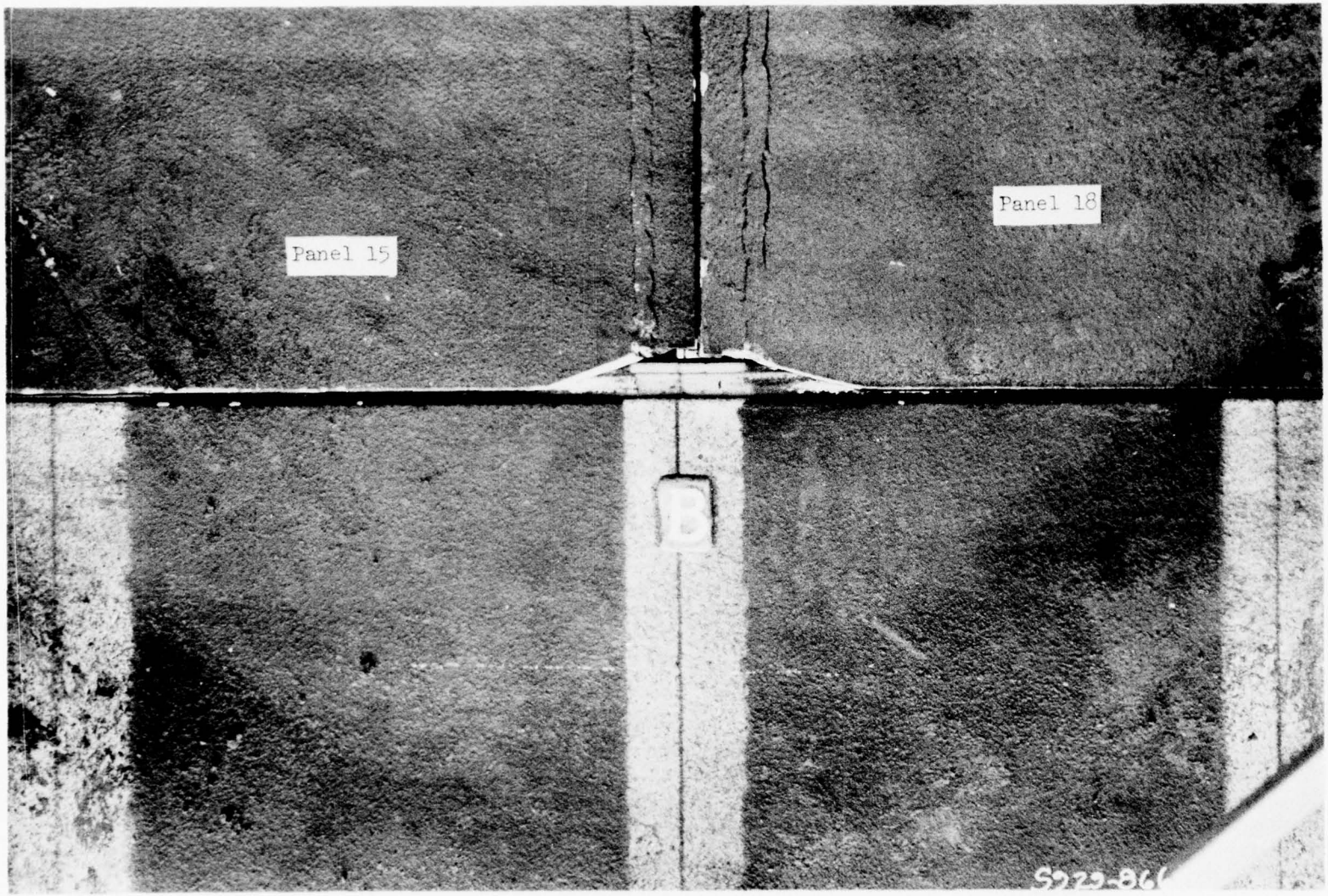
HUGH L. GREEN
Engineer
Chief, Mat Section

CF:
Mr. J. J. Kirschenbaum

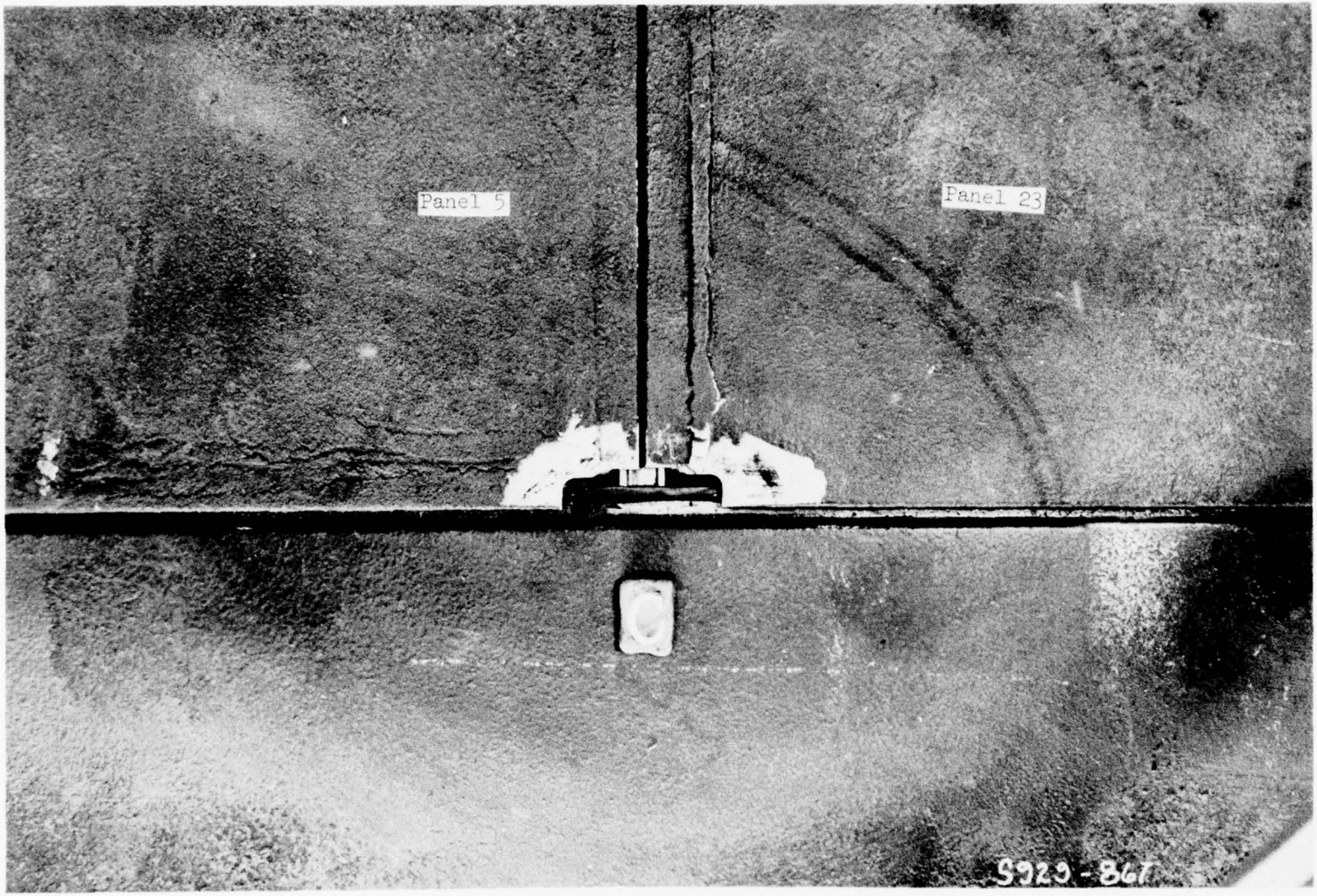


Pair of panels with drilled holes at the female corner

Incl 23



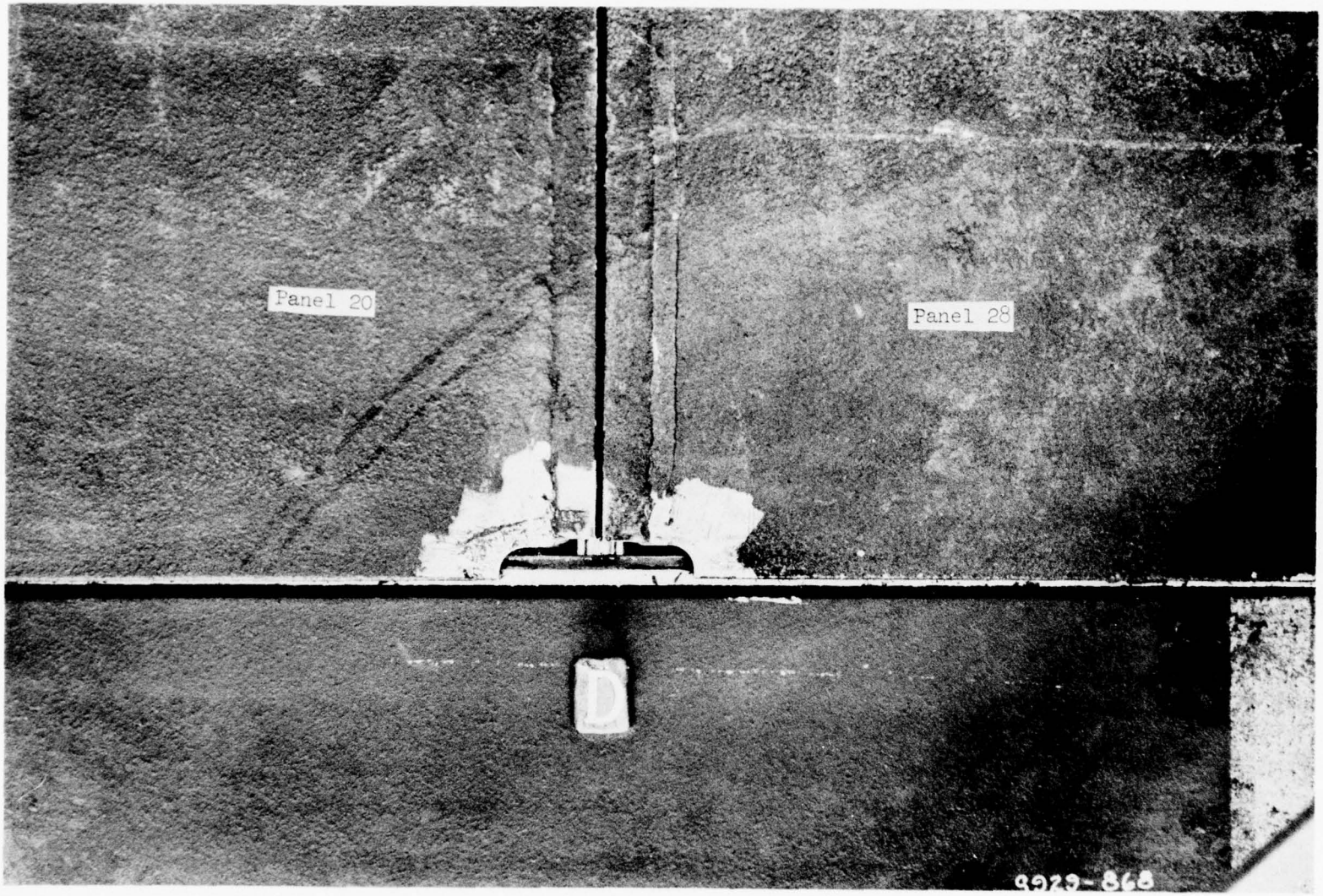
Pair of panels with a taper at the female corner



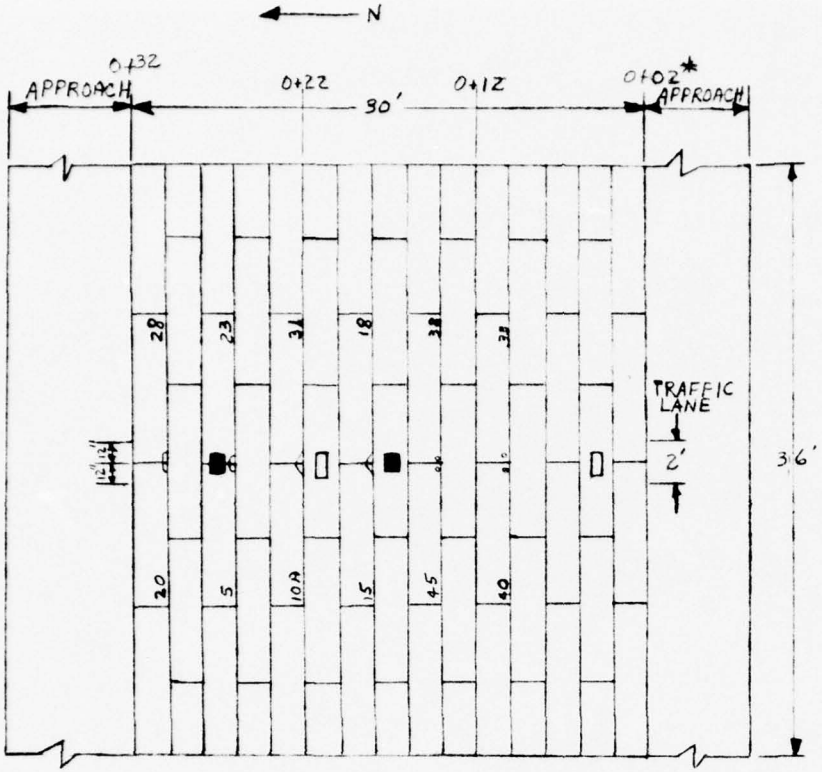
Pair of panels with a 1/4-in. radius at the female corner

Incl 25

Incl 26



Pair of panels with a 1/2-in. radius at the female corner



* STATION NOS. CORRESPOND TO NOS. IN REGULAR TEST

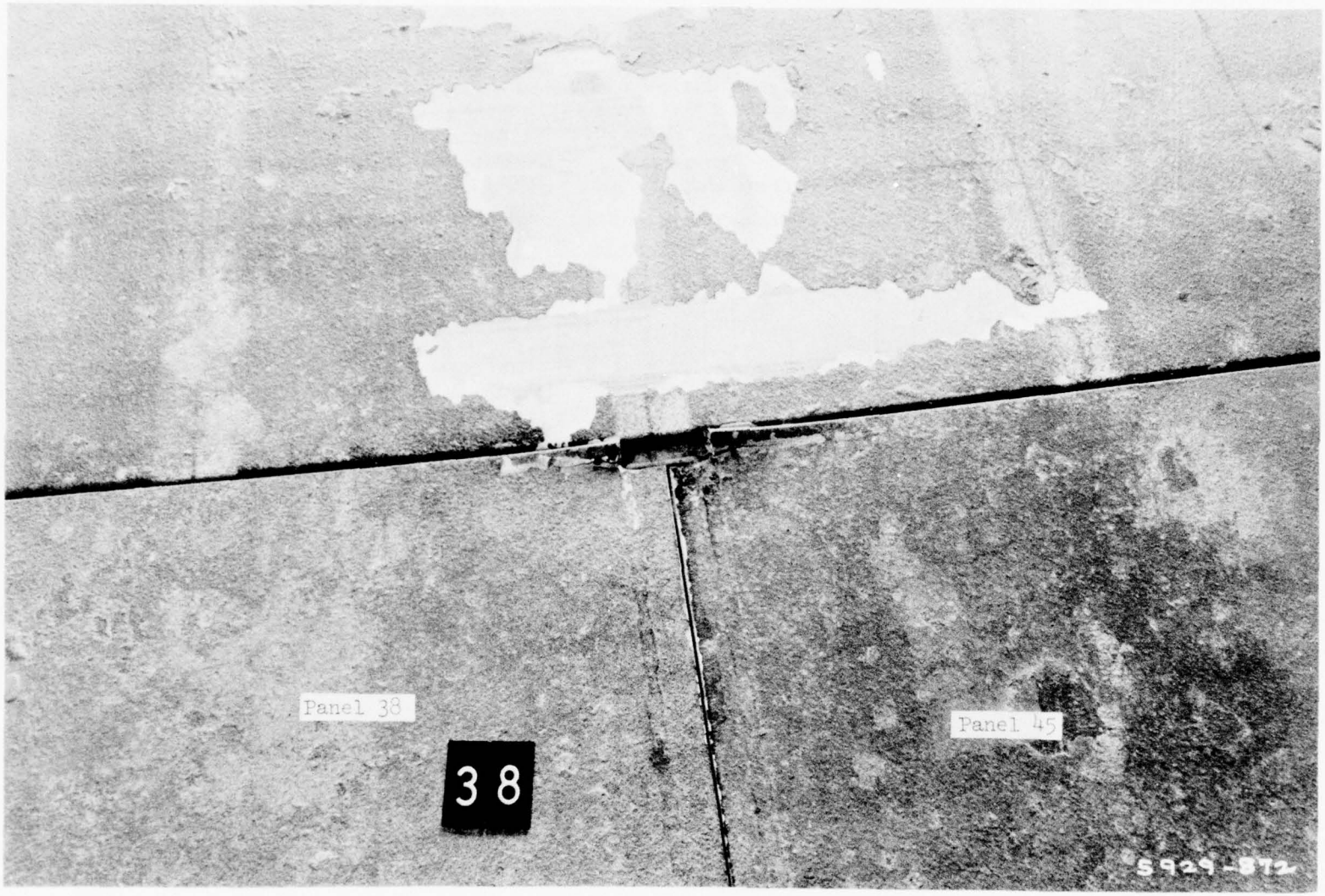
□ CBR PIT AT 0 CHANNELIZED COVERAGES (END OF 240 STANDARD COVERAGES)

■ CBR PIT AT 804 CHANNELIZED COVERAGES

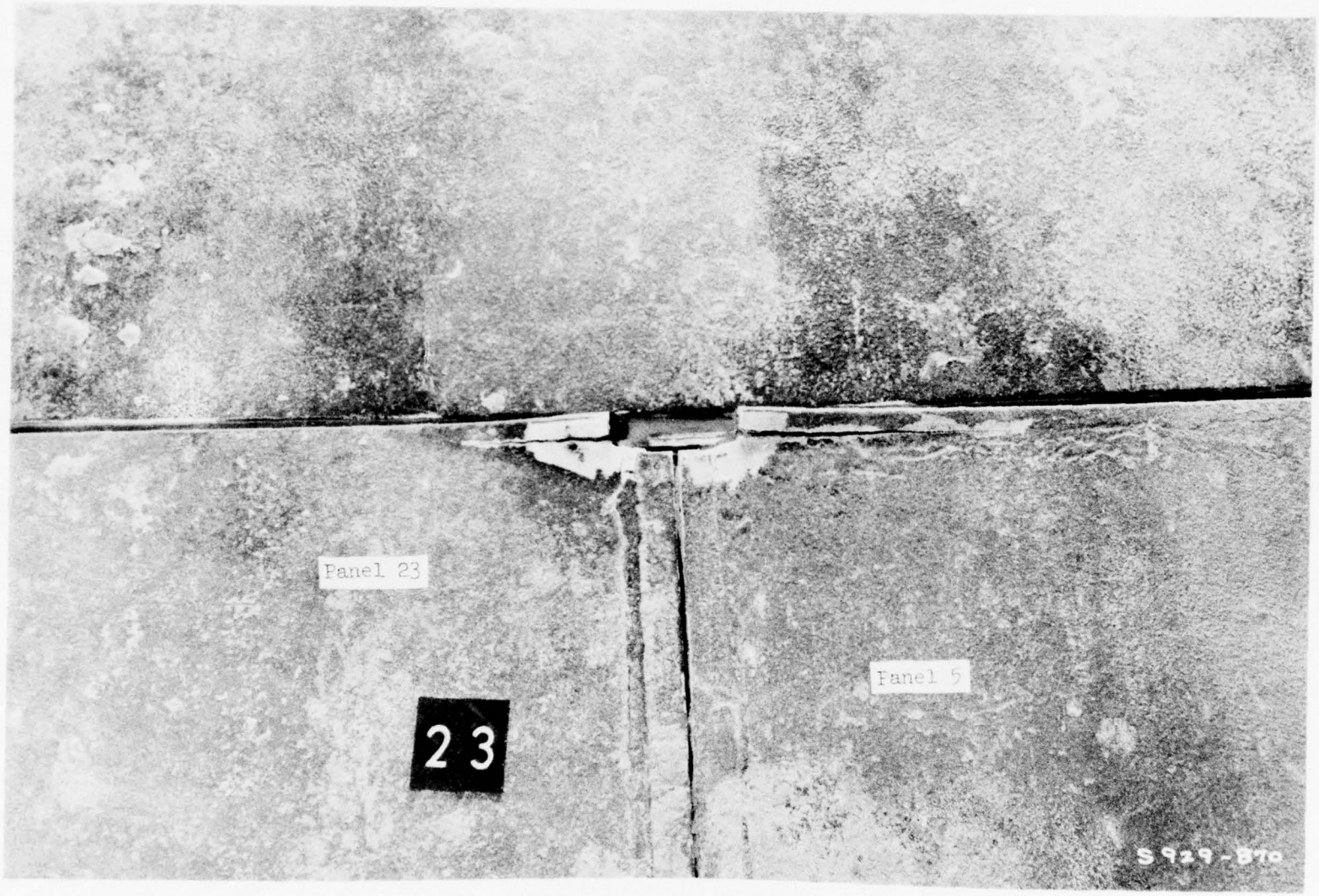
NUMBERED PANELS ARE PANELS MODIFIED AT THE C-RAIL CORNERS - (ENDS MODIFIED WERE NOT SUBJECTED TO TRAFFIC IN STANDARD TEST).

TEST OF PROPOSED MODIFICATIONS

Incl 27



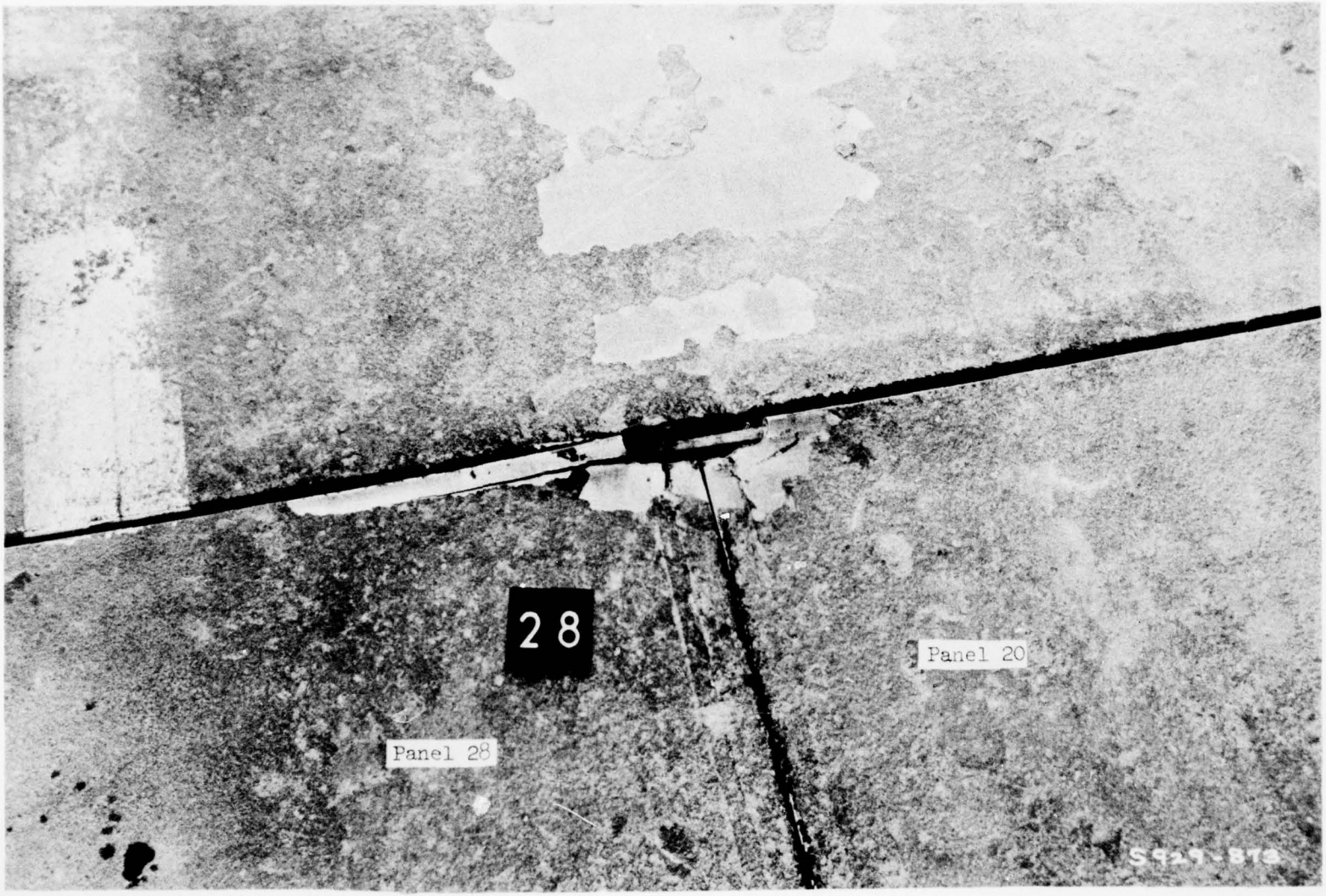
Split in panels 38 and 45 after 363 coverages of channelized traffic



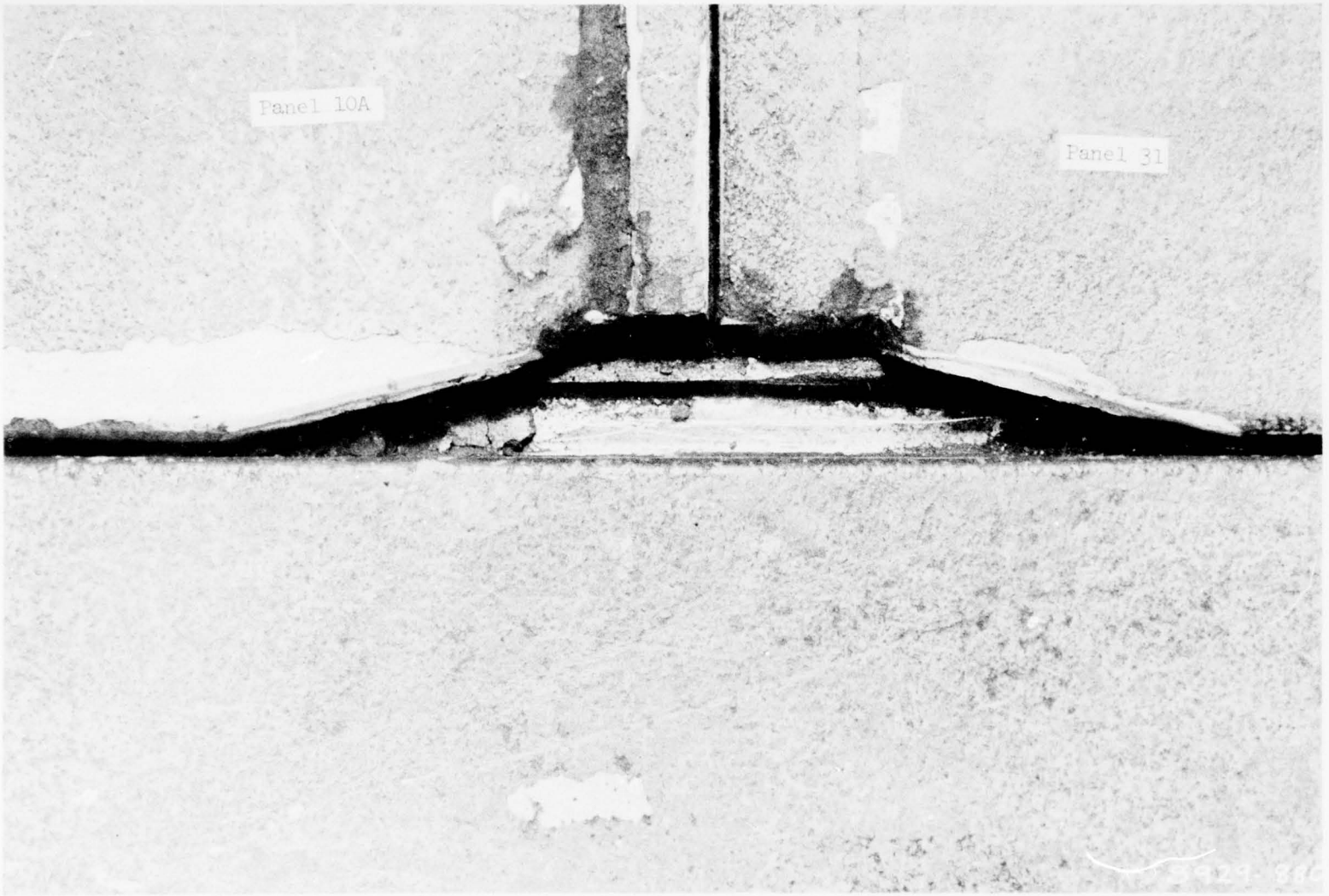
Panels 5 and 23 after 363 coverages of channelized traffic

Incl 29

Incl 30

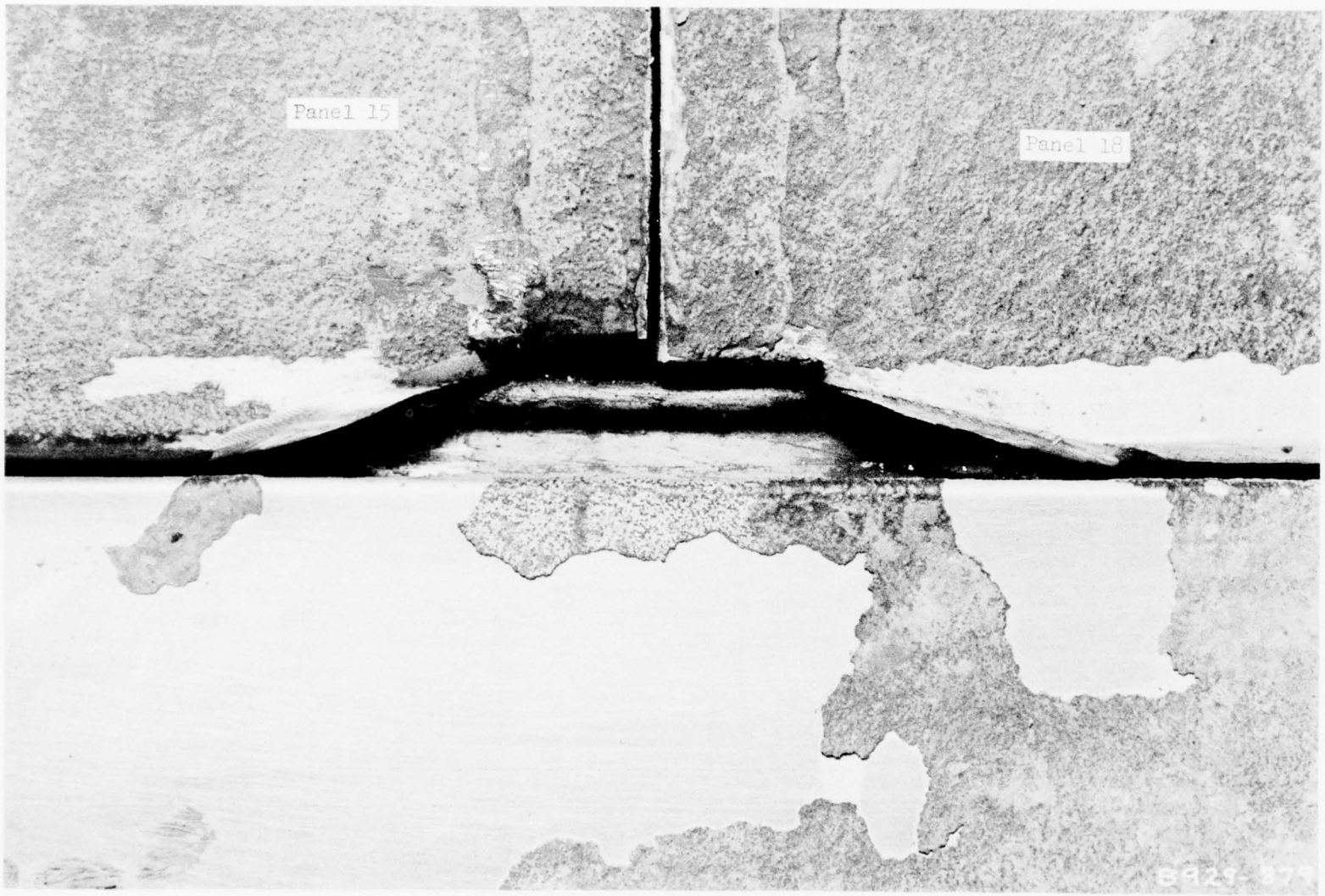


Panels 20 and 28 after 363 coverages of channelized traffic



Panels 10A and 31 after 804 coverages of channelized traffic

Incl 31



Panels 15 and 18 after 804 coverages of channelized traffic

DEPARTMENT OF THE ARMY
WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS
P. O. BOX 631
VICKSBURG, MISSISSIPPI 39180

IN REPLY REFER TO: WESSS

21 December 1972

MEMORANDUM FOR RECORD

SUBJECT: Visit of Mr. G. Keith Glaza, Dow Chemical Company

1. On 18 December 1972, Mr. G. Keith Glaza of the Dow Chemical Company, Midland, Michigan, visited the Mat Section to observe traffic tests on modifications which had previously been made to 12 panels of truss web landing mat. These modifications were intended to eliminate the C-rail corner curl which had occurred during previous traffic tests of a quantity of truss web production mat.

2. There were four different modifications which had been made to a total of 12 panels. The mat was tested using the heavy-duty loading on a 4-CBR subgrade along two lanes of traffic. The tests were continued to 805 coverages of dual-line channelized traffic. Mr. Glaza examined the panels after they had been removed from the test section during the day, and it was agreed that the chamfer modified panels appeared to be the best way to modify the mat based on the appearance of these panels at the completion of traffic.

3. Messrs. Glaza, R. G. Ahlvin, W. L. McInnis, and D. W. White and I met during the day and the items discussed are summarized below:

a. The Dow Russellville plant has made metallurgy and radiography analyses of the failed panels and in comparison to the original experimental mat, the production mat appears stronger as the yield and ultimate strengths are higher. However, Dow will continue to pursue the premature failures, although it may take a few months. They definitely tend to find out what caused these failures.

b. Based on the results of the channelized traffic tests, Mr. Glaza indicated that apparently the answer in eliminating the problem was using the chamfer modification. He proceeded to make a drawing of the chamfer modification for Mr. Fred H. Eckert in order that the Russellville plant might begin acquiring the necessary tooling to make modifications to additional experimental quantities of mat for tests at Vicksburg.

---

* A table of factors for converting British units of measurement to metric units is presented immediately after the Foreword.

c. Mr. Glaza indicated that he personally would be present when the modifications were made, and it would be a machine operation with routers and clamps for uniformity and no human elements would be involved (i.e. this could not be a hand operation).

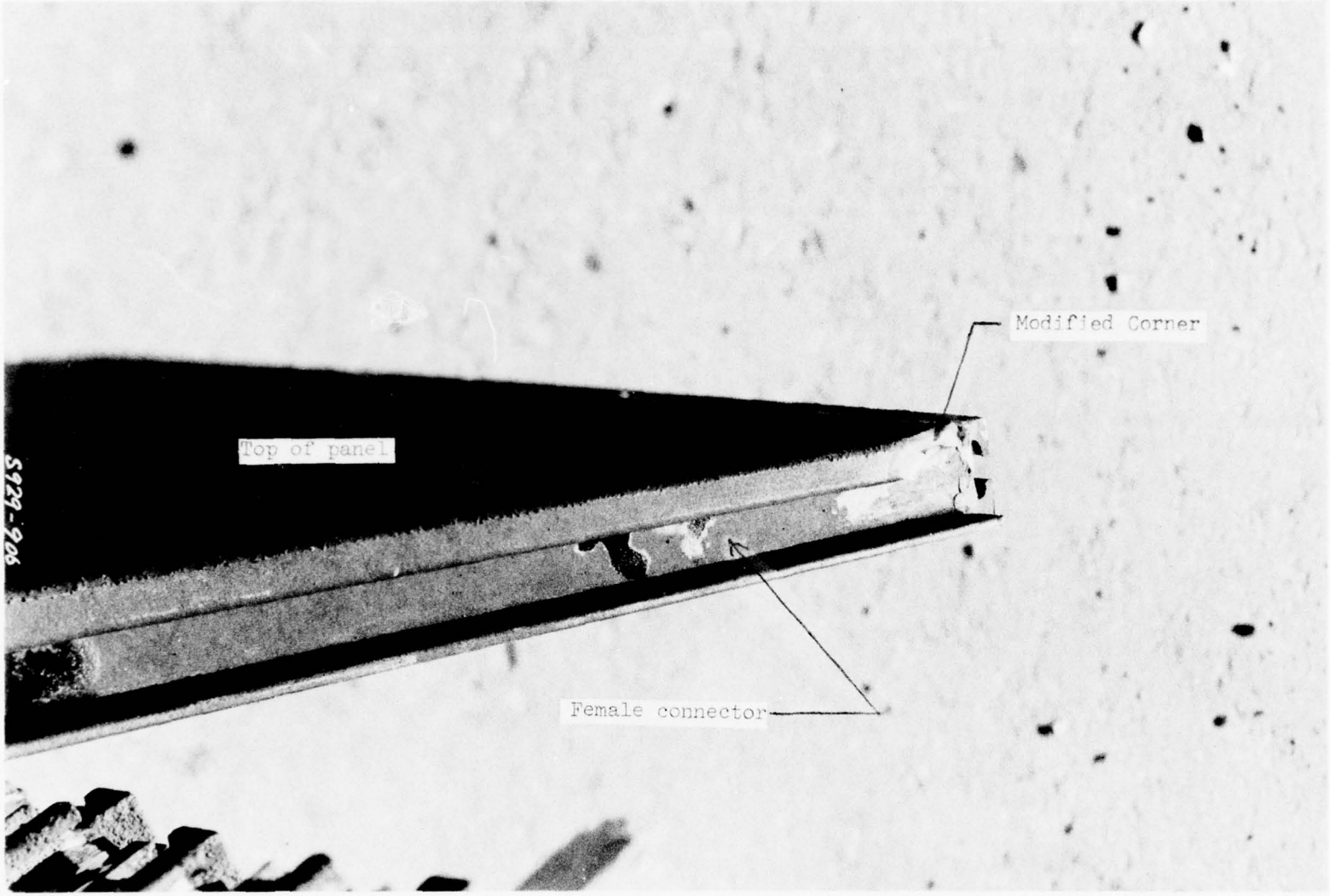
d. We indicated that three additional bundles of mat would be required for a roll test and Mr. Glaza indicated they would secure the bundles from Dyess AFB with our assistance in their selection and hoped to have the mat back to us in early January. WES will also furnish to Dow's Russellville plant 12 whole and 16 half production panels for modification to be used in the roll test.

e. We indicated that the WES was preparing a letter to Dow which would state that the production mat tested had failed to meet the performance requirements stipulated in the contract. Once Dow has received this letter, they will respond to the WES by suggesting a method which they would like to use to modify the mat and thus, propose a modification to the mat drawing.

4. Mr. Glaza indicated that Dow was most concerned over the performance that had developed and they would definitely develop a solution which would be satisfactory and would put much emphasis on determining exactly what caused this abnormality. Mr. Glaza indicated he was pleased to know that one of the modifications which was used was apparently giving satisfactory results and he felt this would be reflected in the next roll test.

HUGH L. GREEN
Engineer
Chief, Mat Section

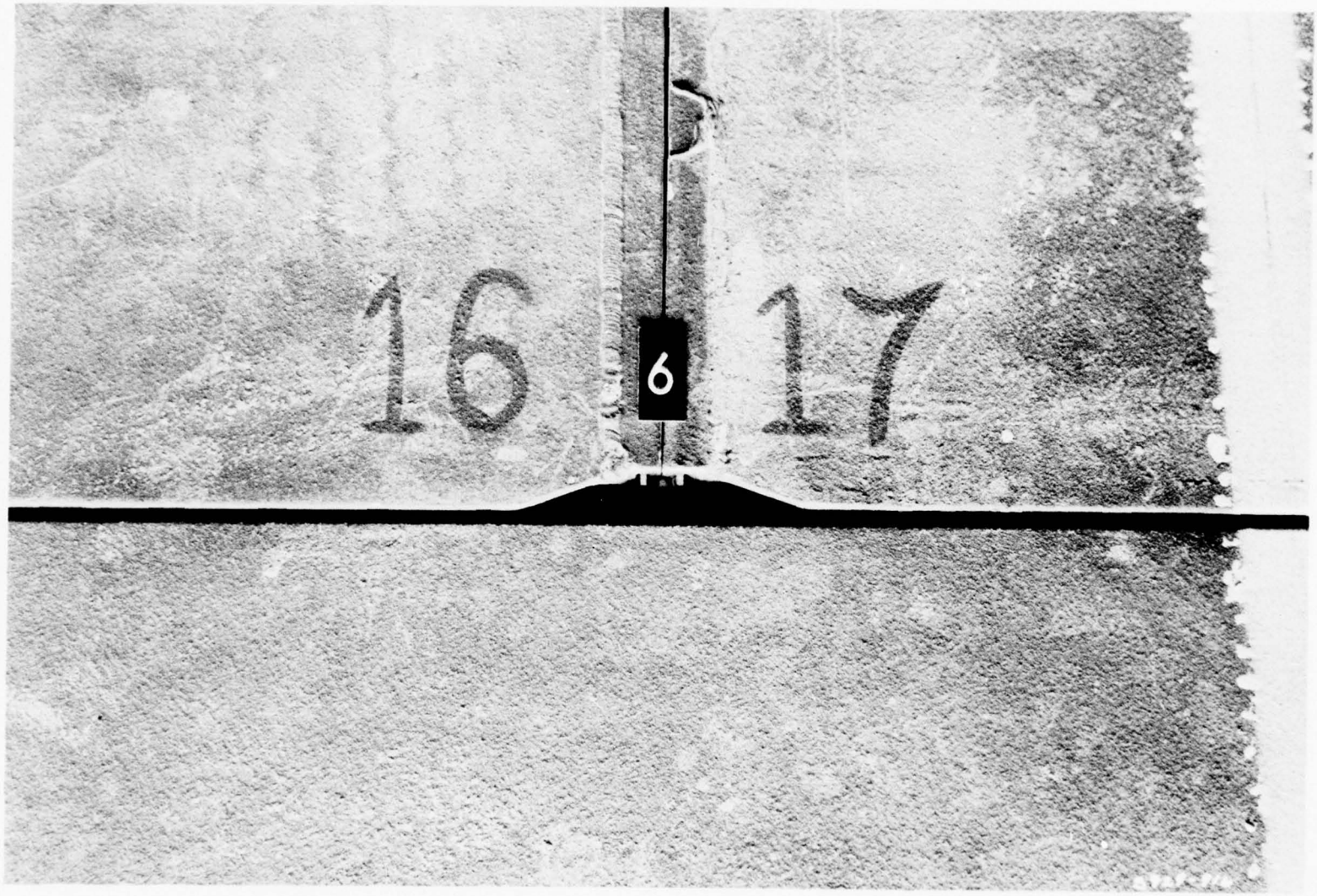
CF:
Mr. J. J. Kirschenbaum
Mr. D. W. White



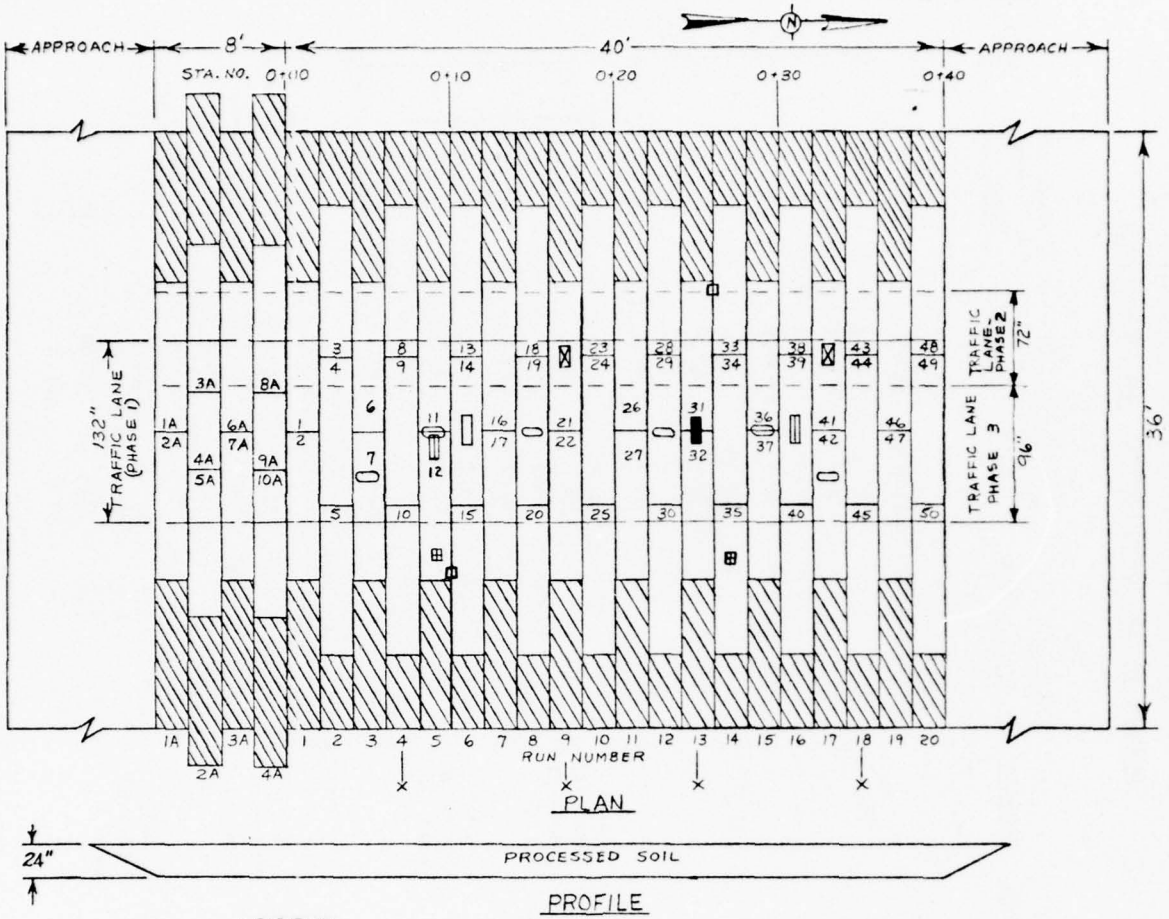
Modified production truss web panel

Incl 34

Incl 35



Juncture of modified panels



TEST SECTION LAYOUT
MODIFIED PRODUCTION TRUSS WEB
HEAVY DUTY MAT

Incl 36

2- by 9-ft Modified Production Truss Web Mat

SUMMARY OF CBR, WATER CONTENT, AND DENSITY DATA

No. of Coverages	Location	Depth in.	CBR	Water Content %	Dry Density pcf	Average CBR for Coverage Level	Rated CBR
			Standard Traffic Pattern - Phase 1*				
0	0+10	0	3.7	30.3	89.0		
		6	4.0	29.6	88.6		
		12	4.3	30.3	89.1		
		Avg	4.0	30.0	88.9	3.9	
0	0+26	0	3.7	30.7	87.9		
		6	3.8	31.0	88.3		
		12	4.2	30.4	88.5		
		Avg	3.9	30.7	88.2		4.0
770	0+25 Joint of panels 31 and 32	0	3.8	30.8	87.7		
		6	4.0	30.0	89.0		
		12	3.7	30.0	90.6		
		Avg	3.8	30.3	89.1	4.2	
1040	0+11 Center of panel 14	0	4.4	29.6	90.4		
		6	4.6	29.3	90.8		
		12	4.5	29.0	90.2		
		Avg	4.5	29.3	90.5		
			100 Percent Traffic Pattern - Phase 2**				4.7
832	0+17 Center of panel 21	0	6.0	30.0	88.4		
		6	5.0	29.3	90.6		
		12	6.0	28.6	92.0		
		Avg	5.7	29.3	90.3	5.2	
	0+33 Center of panel 41	0	4.6	31.6	88.1		
		6	4.9	30.1	89.5		
		12	4.5	30.6	87.6		
		Avg	4.7	30.8	88.4		

* See Incls 8 and 54.

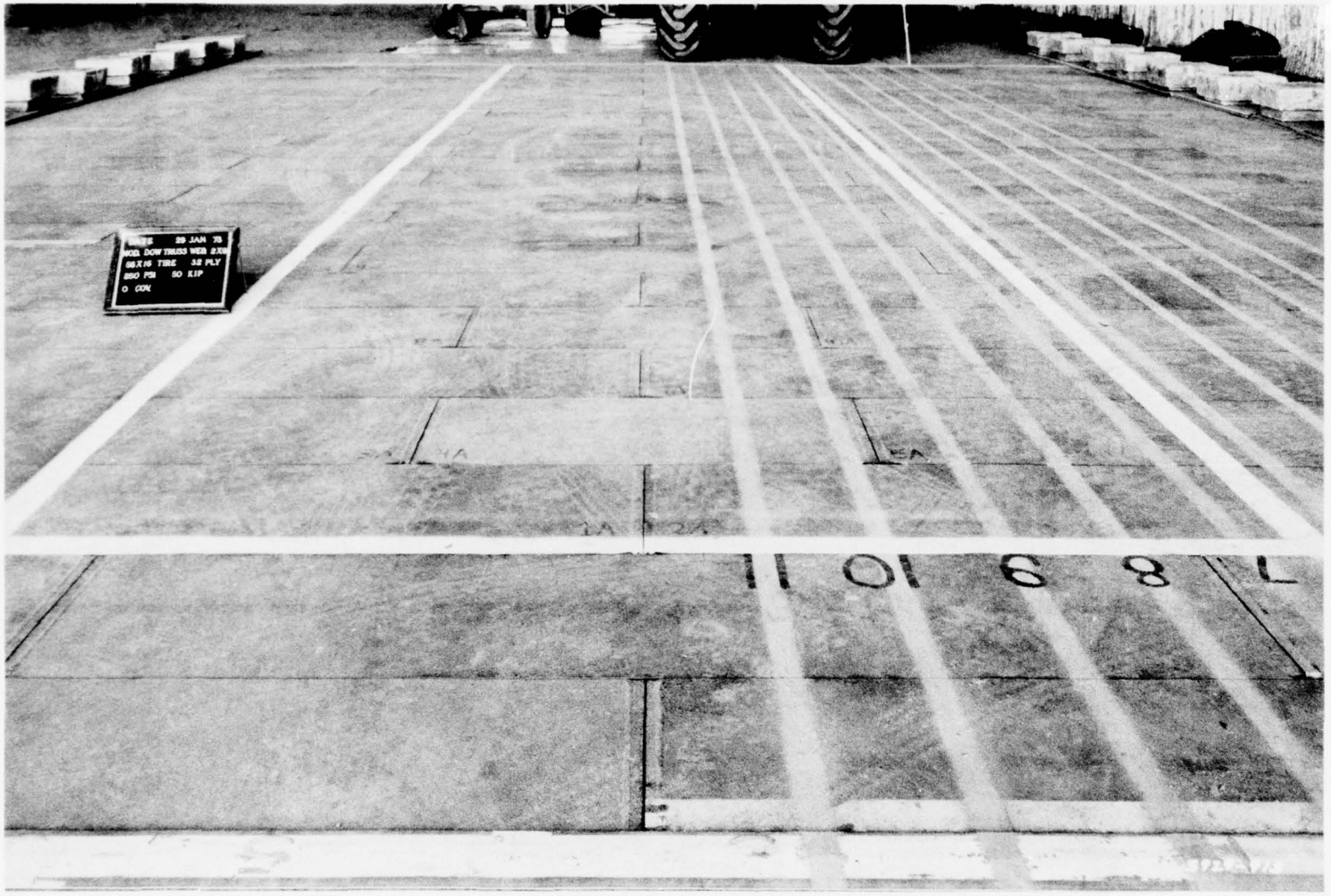
** Additional coverages added to one side of traffic lane to obtain 100 percent of coverages on more mat end joints. This traffic was designated Phase 2 (see Incl 54).

SUMMARY OF CBR, WATER CONTENT, AND DENSITY DATA (cont'd)

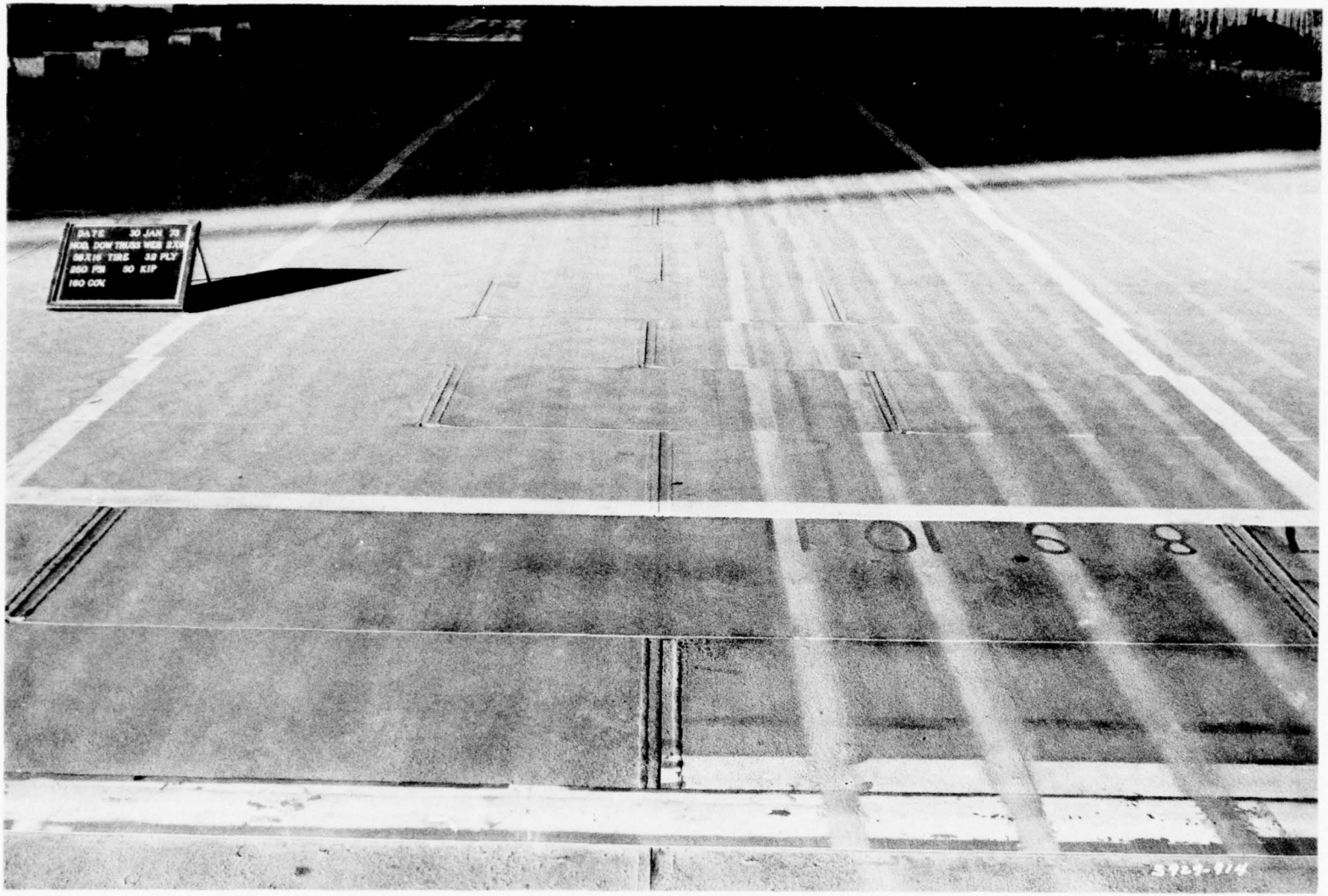
No. of Coverages	Location	Depth in.	CBR	Water Content %	Dry Density pcf	Average CBR for Coverage Level	Rated CBR
			Reprocessed Subgrade - Phase 2				
0	0+09	0	3.7	29.4	90.5		
		6	3.7	29.3	90.0		
		12	3.9	30.2	89.0		
		Avg	3.8	29.6	89.8	3.5	
0	0+27	0	3.2	29.9	88.6		3.5
		6	3.0	29.5	88.9		
		12	3.1	29.0	88.6		
		Avg	3.2	29.5	88.7		
210							
			Standard Traffic Pattern - Phase 3†				
0						3.5	
300	0+09 Panel 12 (west 1/4 point)	0	3.9	29.4	89.3		
		6	3.9	29.8	89.0		3.9
		12	3.8	30.3	89.8		
		Avg	3.9	29.8	89.4	4.2	
300	0+31 Panel 39 (east 1/4 point)	0	4.9	29.2	90.1		
		6	4.0	29.6	90.2		
		12	4.3	29.5	90.9		
		Avg	4.4	29.4	90.4		

† See Incl 54. These coverages on lanes 1-8 added in manner of the standard pattern. This traffic was designated Phase 3.

Incl 38

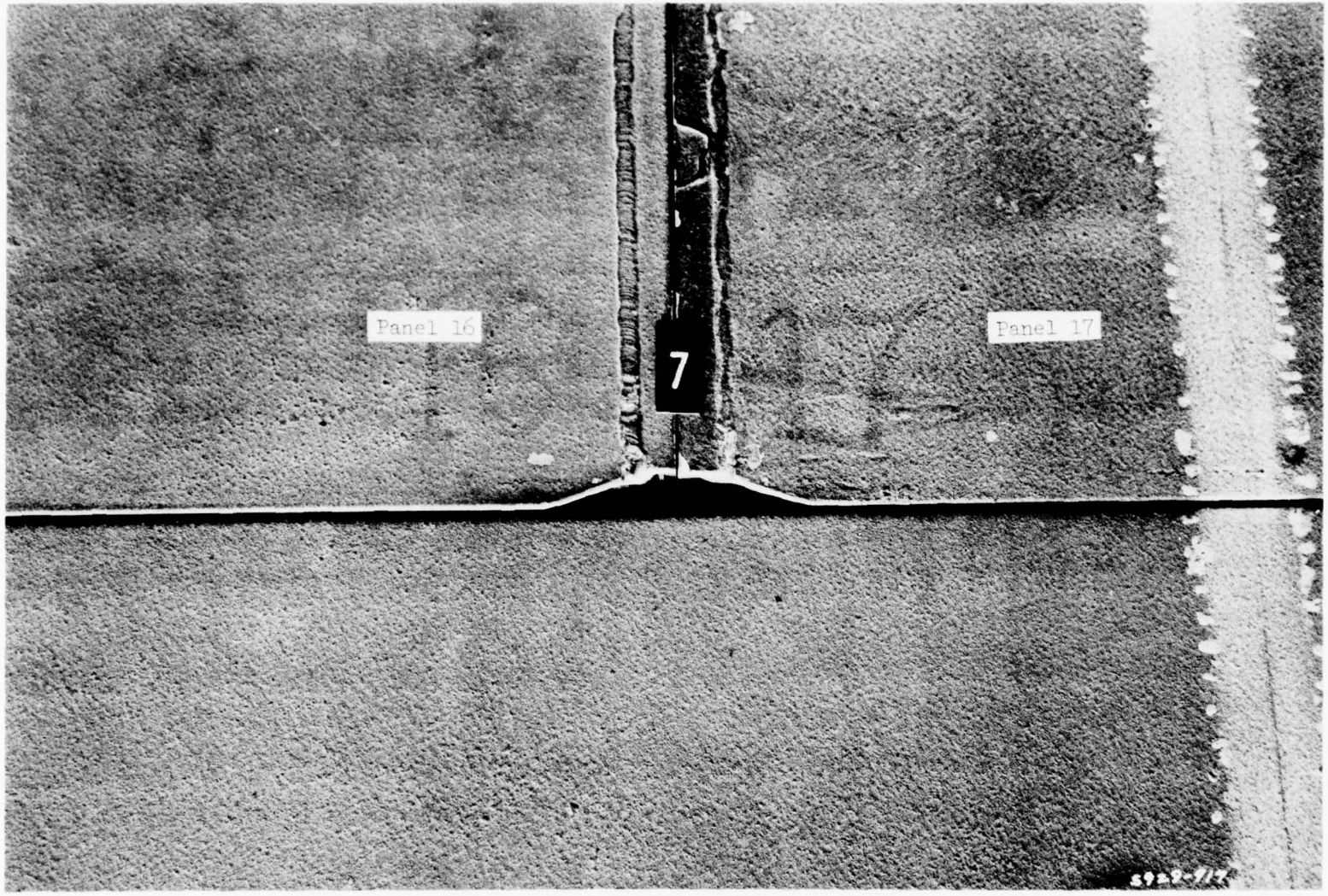


Test section of modified truss web mat prior to Phase 1 traffic

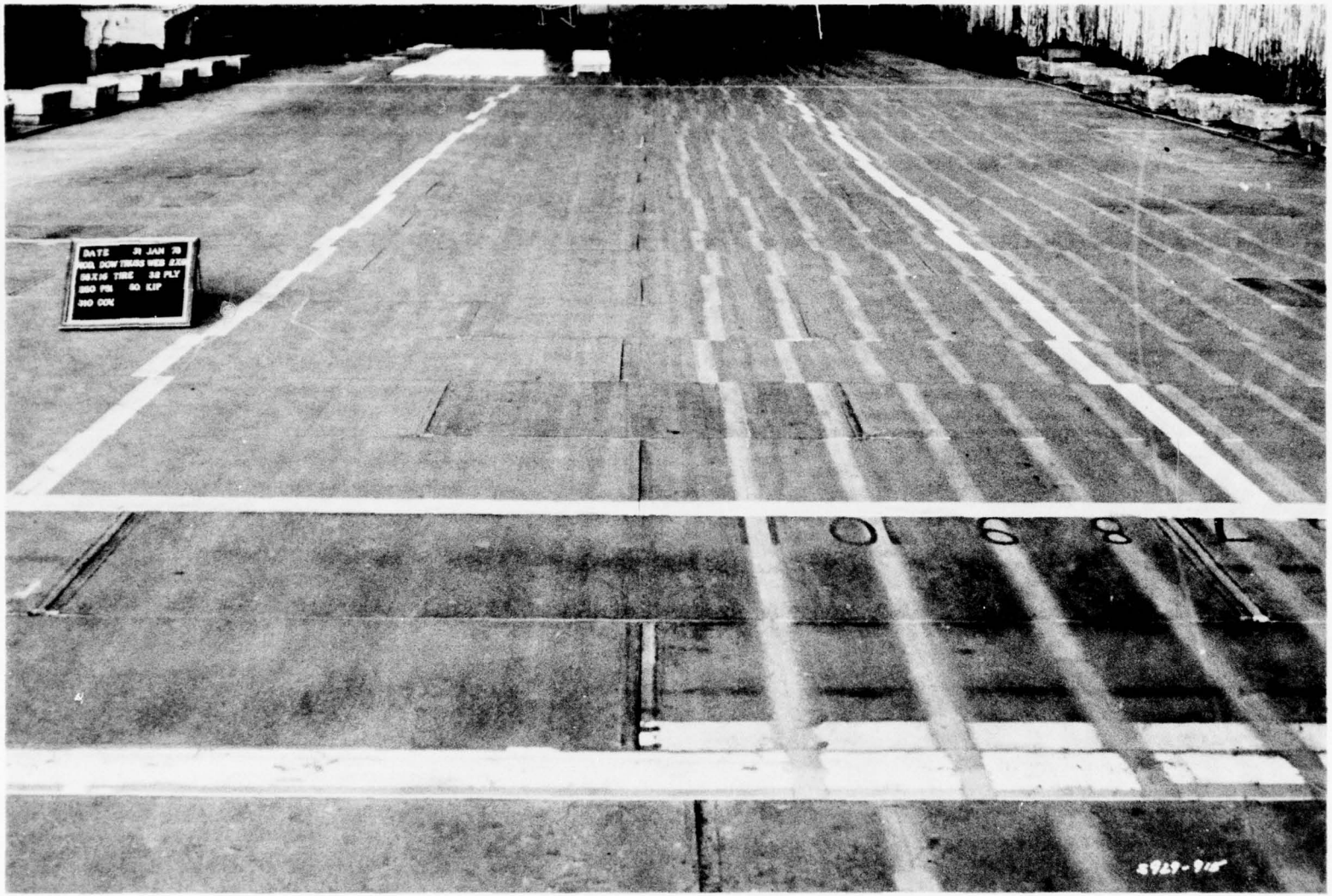


Test section at the end of 160 coverages, Phase 1

Incl 40



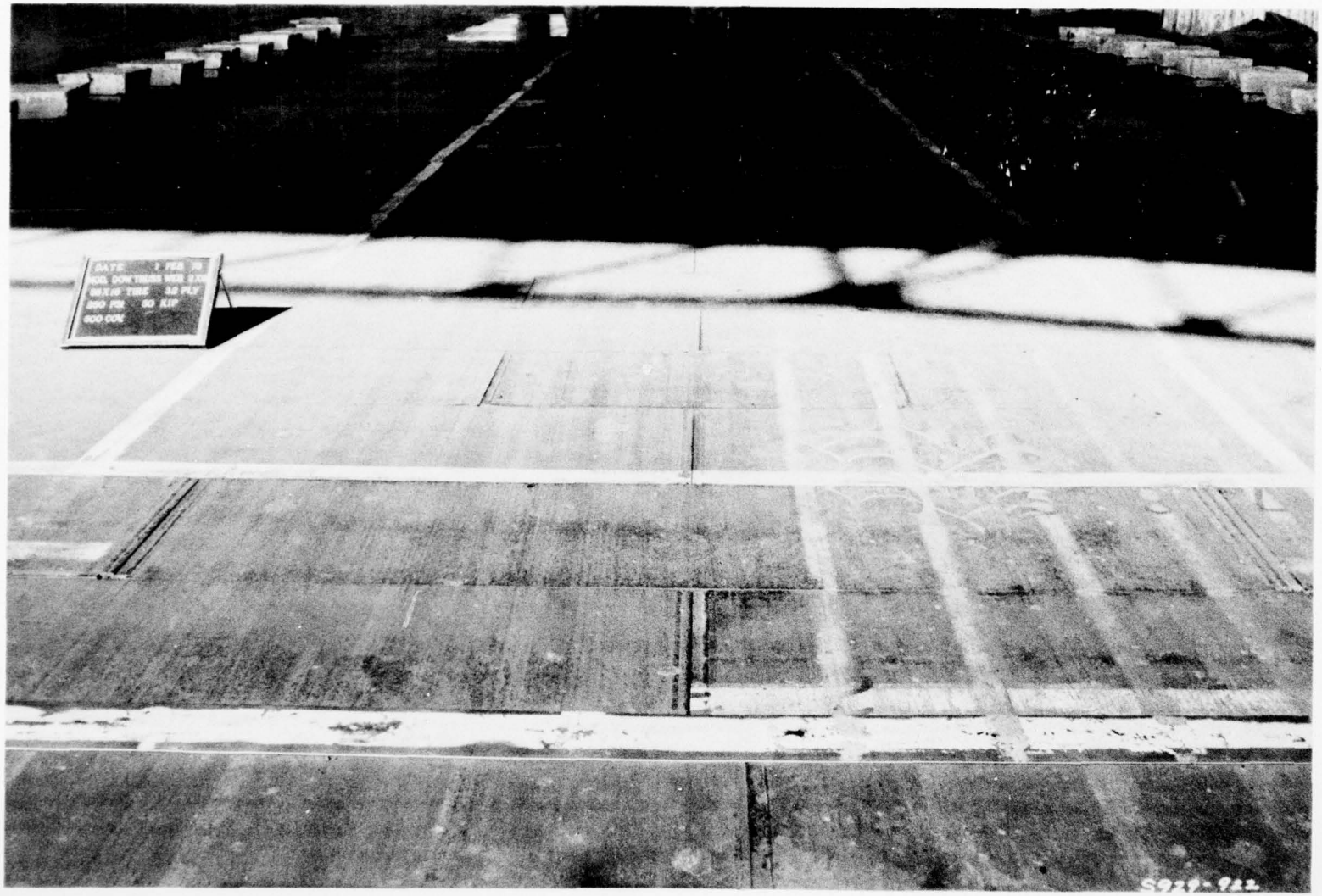
End joint of panels 16 and 17 after 160 coverages, Phase 1



Test section after 310 coverages, Phase 1

Incl 41

Incl 42

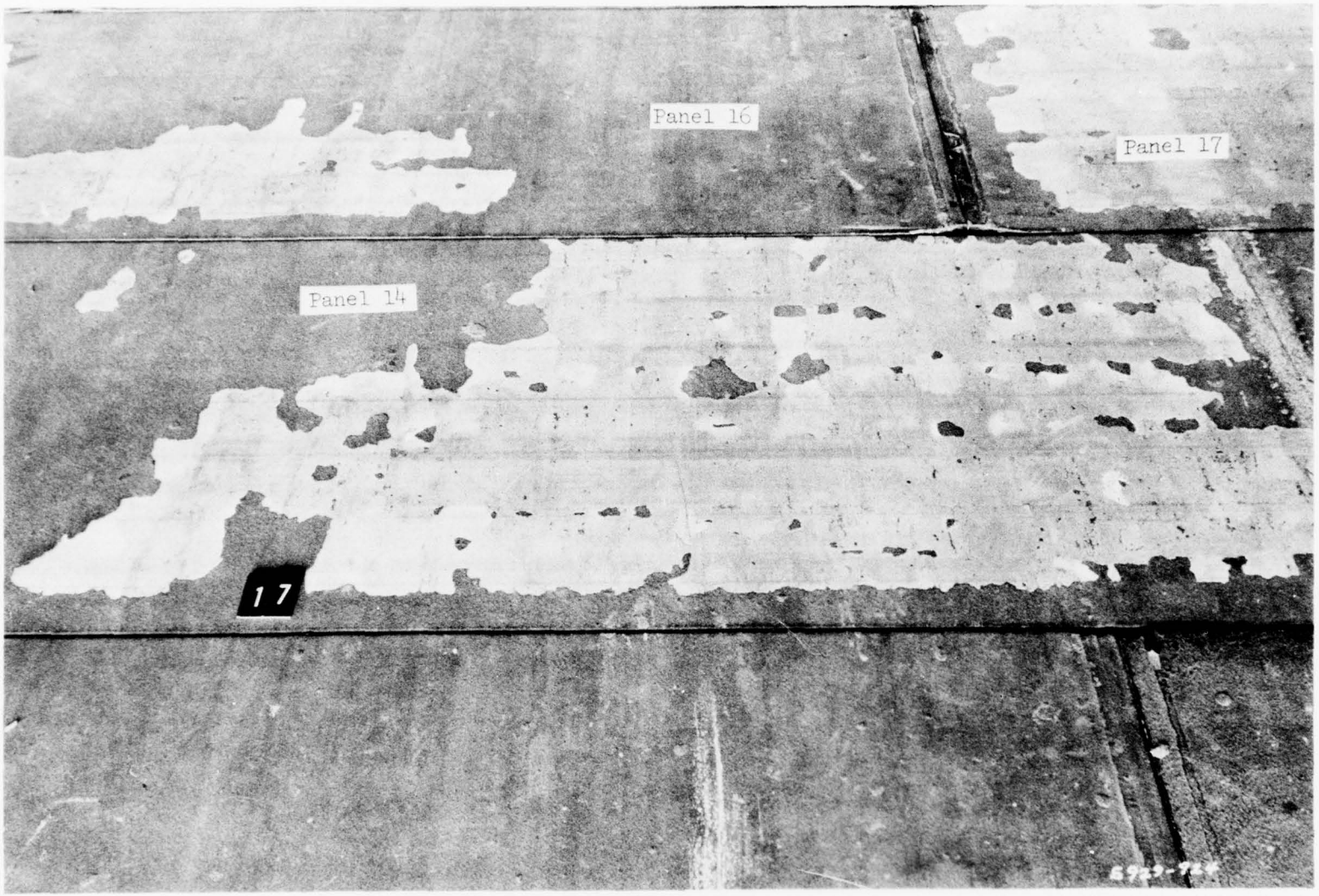


Test section after 500 coverages, Phase 1

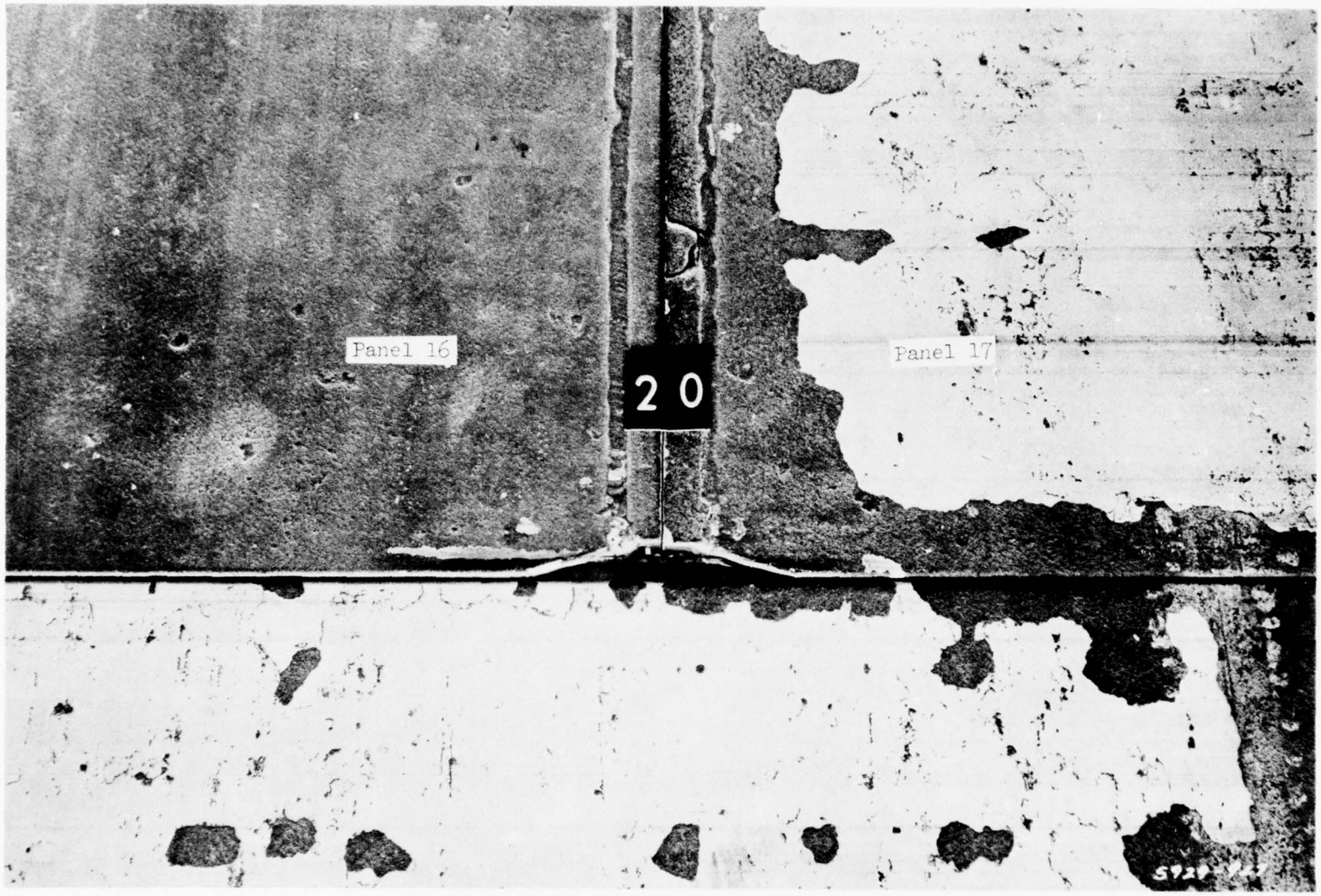
Panels 16 and 17 after 500 coverages, Phase 1

Incl 43

Incl 14



Bare areas on panels 14, 16, and 17 where antiskid had come off after 500 coverages, Phase 1



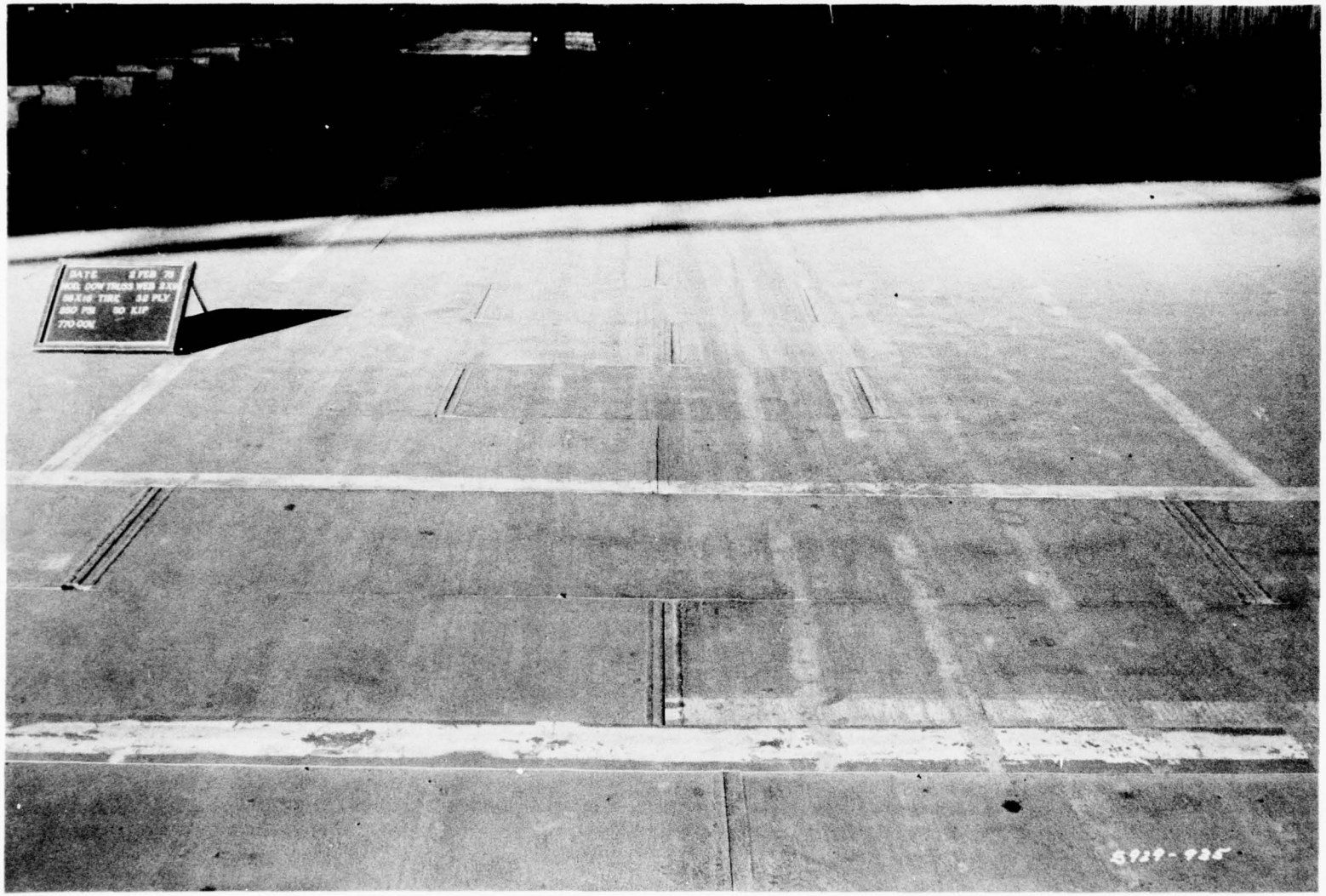
Panels 16 and 17 after 760 coverages, Phase 1

Split in female connector of panel 21 after 760 coverages, Phase 1

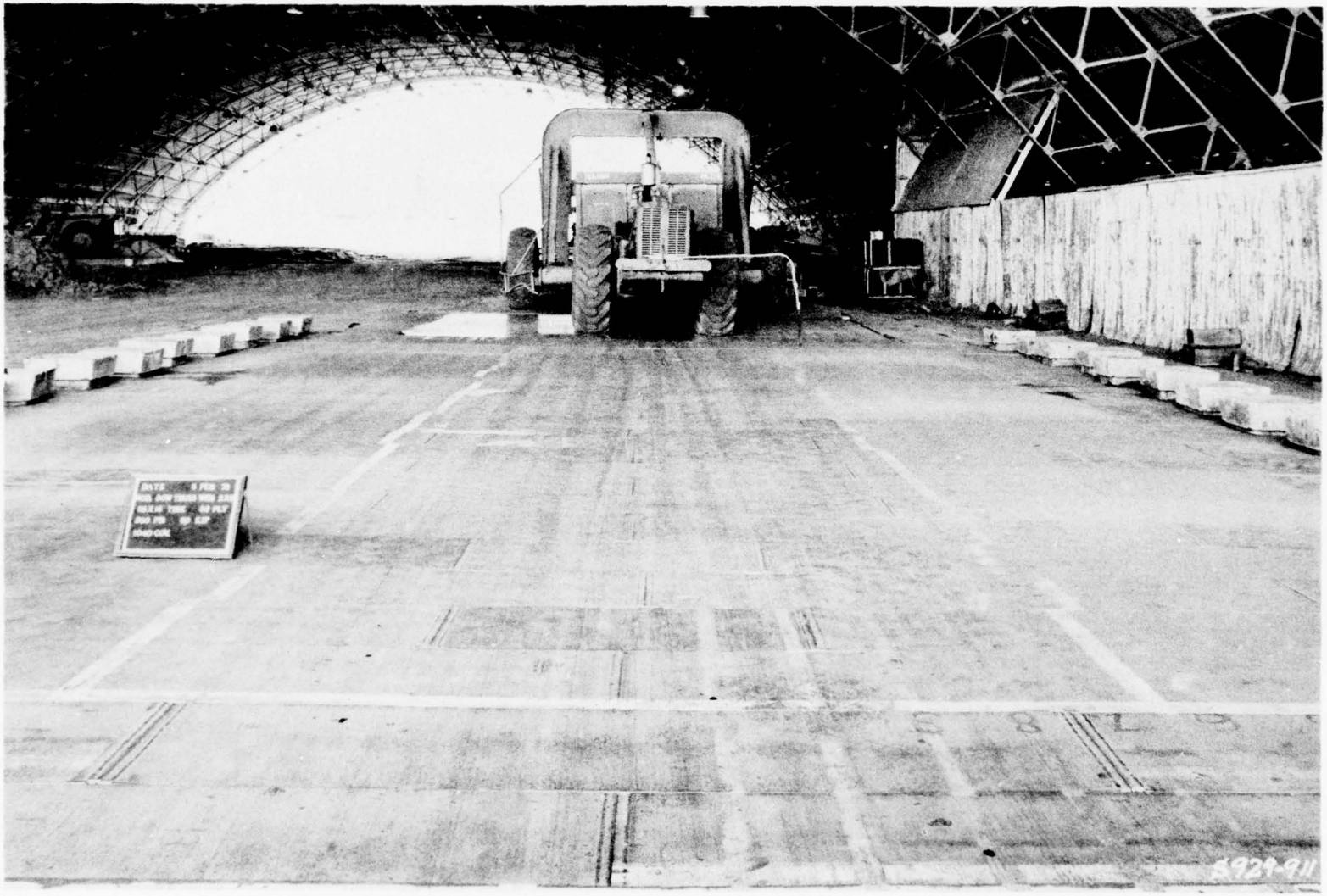
Split in female connector of panels 31 and 32 after 760 coverages, Phase 1

Incl 47

Incl 48



Test section after 770 coverages, Phase 1

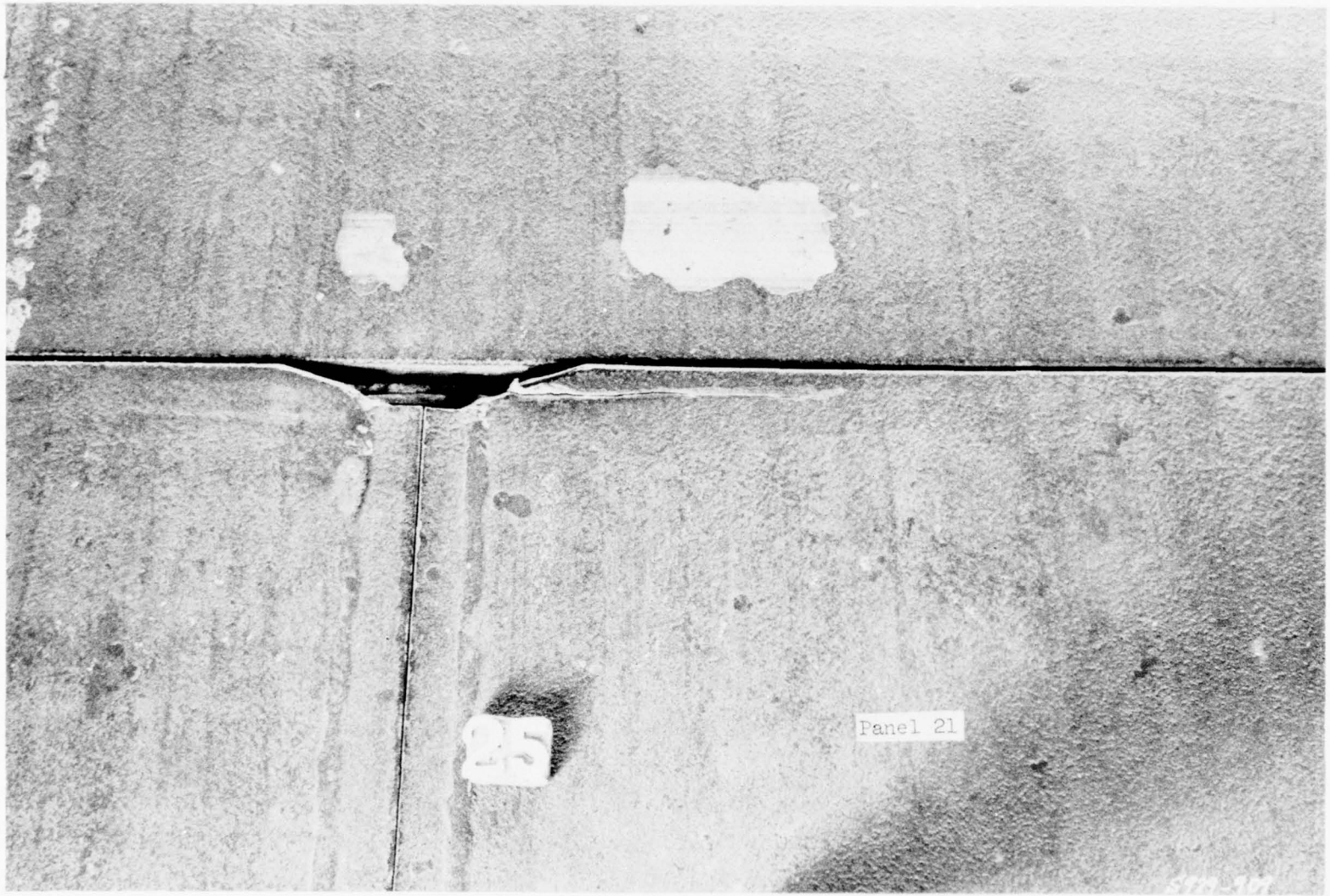


Test section after 1040 coverages, Phase 1

Incl 49

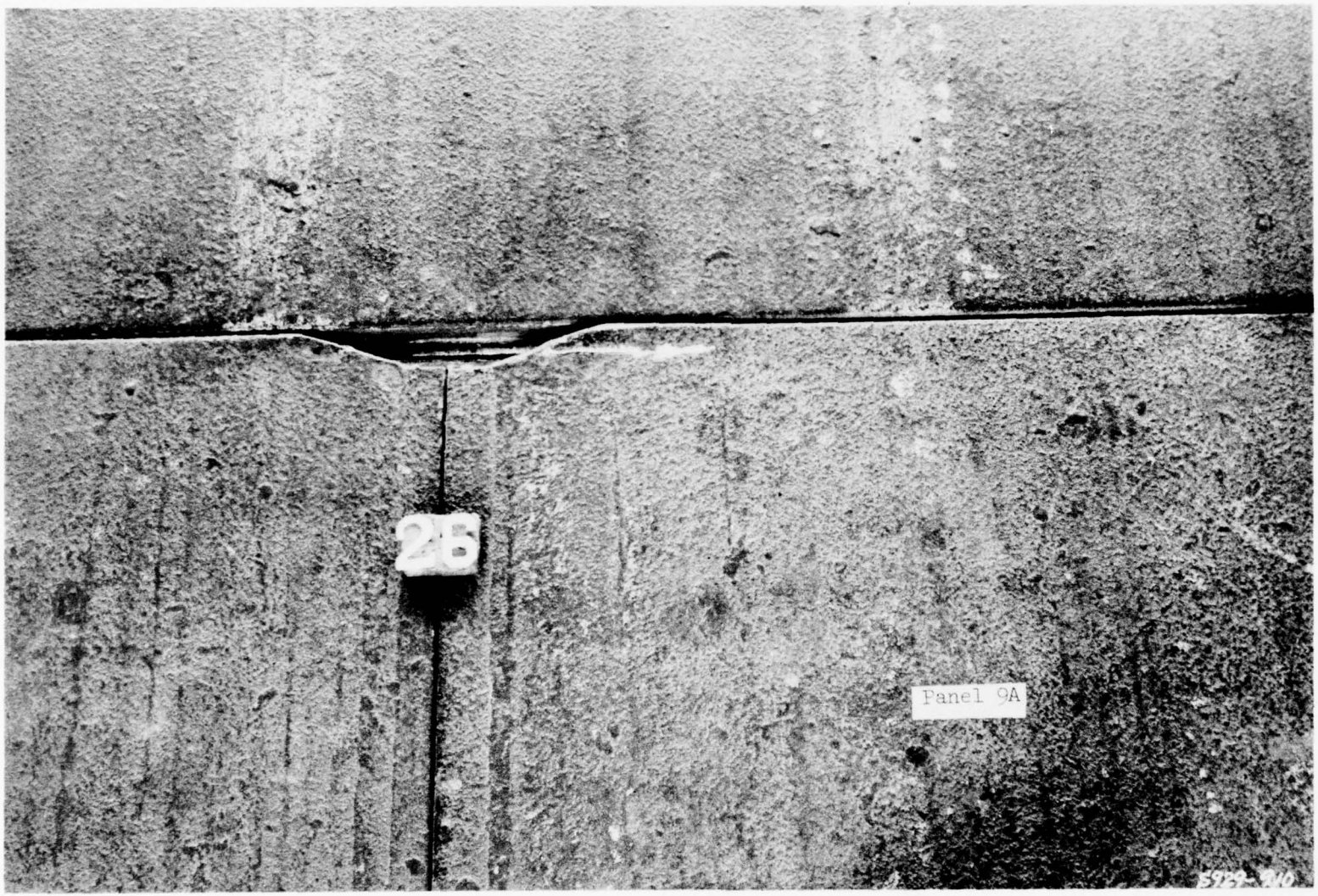
Incl 50

Weld crack at male I-lock corner of panel 41 after 1040 coverages, Phase 1

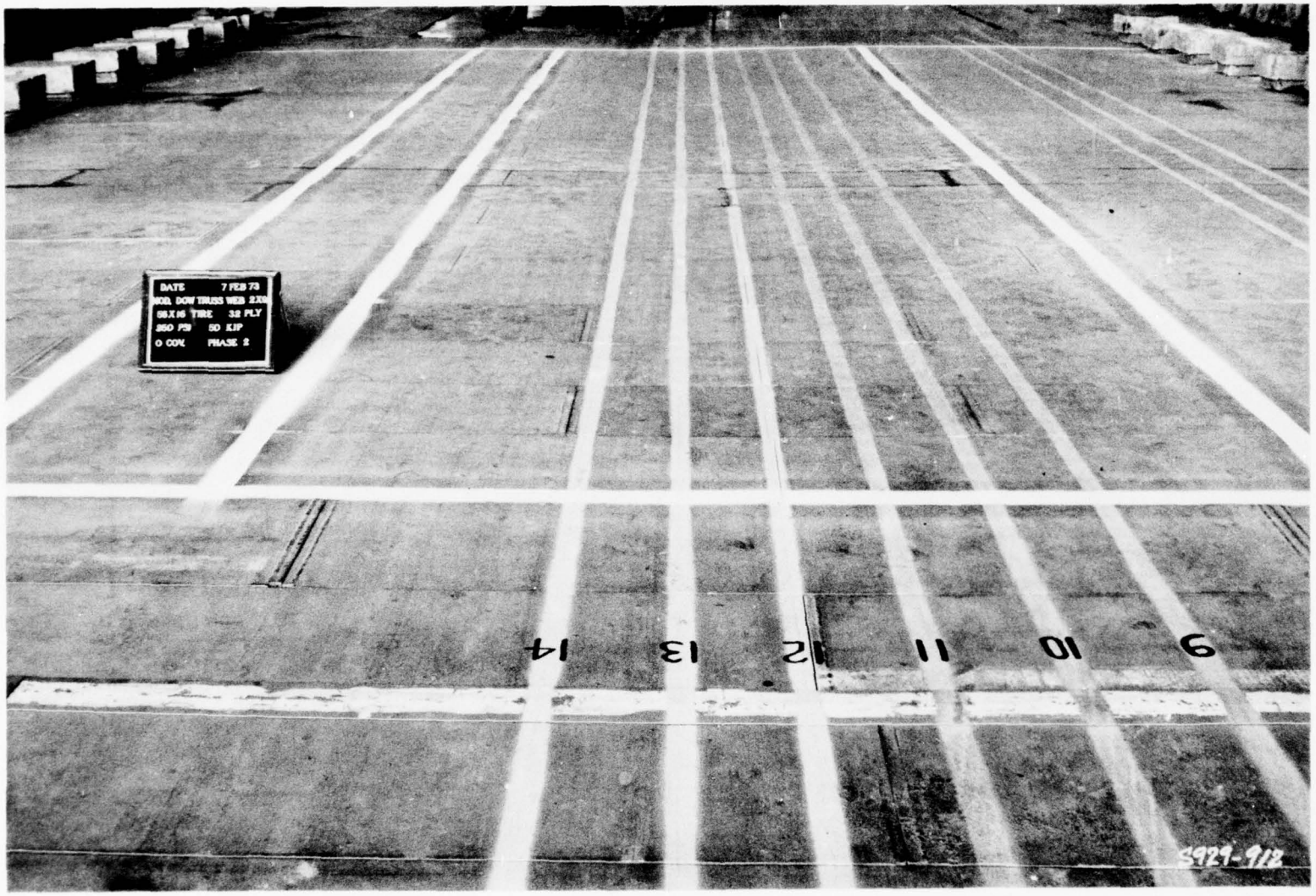


Split in female connector of panel 21 after 1040 coverages, Phase 1

Incl 51

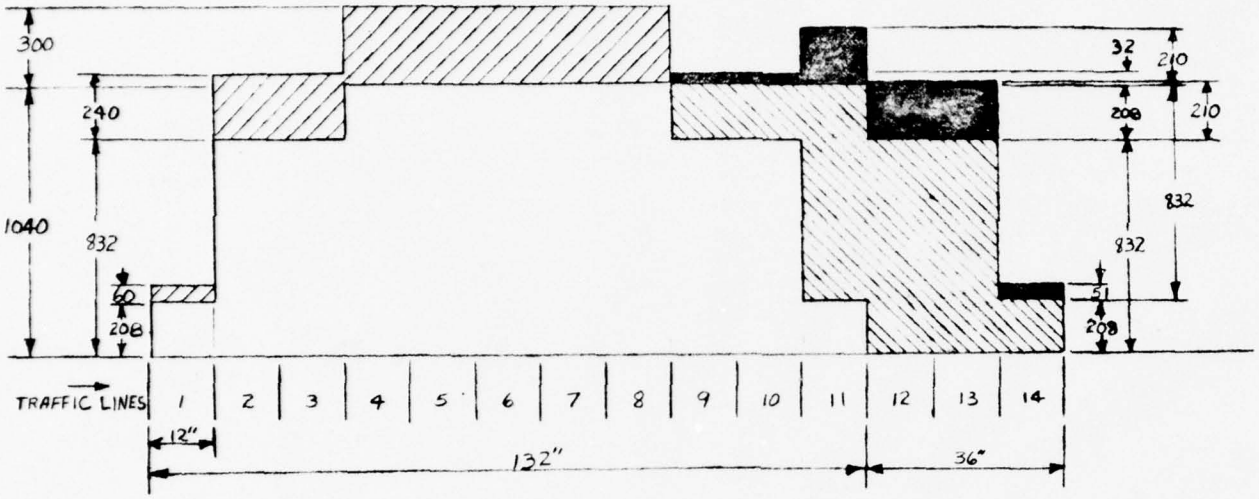


Panel 9A (half panel) after 1040 coverages, Phase 1



Test section of modified truss web mat prior to Phase 2 traffic

ACTUAL TRAFFIC APPLIED ON MODIFIED PRODUCTION TRUSS WEB LANDING MAT



LEGEND

- STANDARD TRAFFIC-PHASE 1
- PHASE 2 - 100 PERCENT COVERAGE
- PHASE 2 - SUBGRADE REPROCESSED
- PHASE 3

TOTAL ACTUAL COVERAGES-EACH LINE

LINE	COVERAGES
1	268
2-3	1072
4-8	1340
9-10	1072
11	1250
12-13	1042
14	259

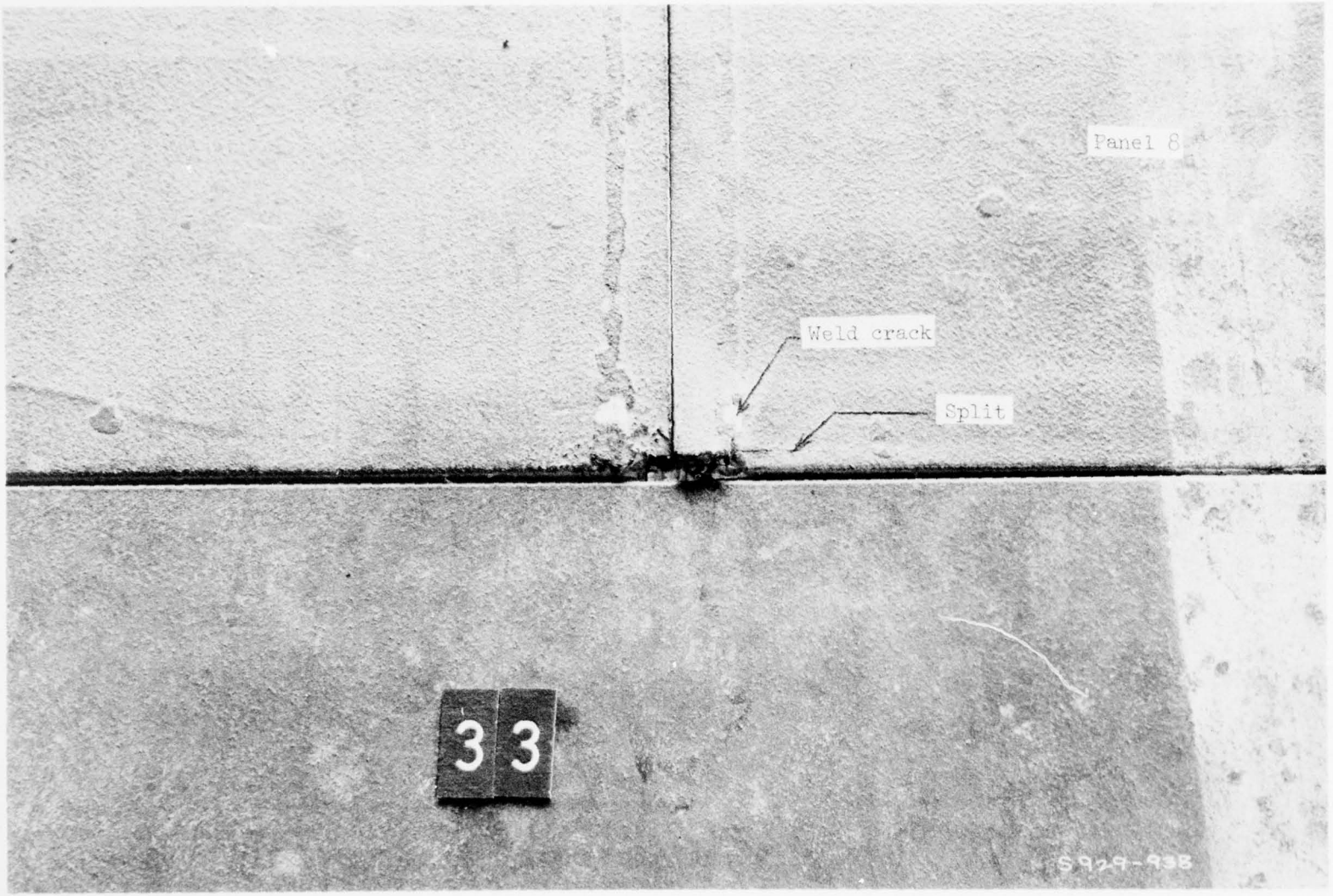
Test section after 832 coverages, Phase 2

Incl 55

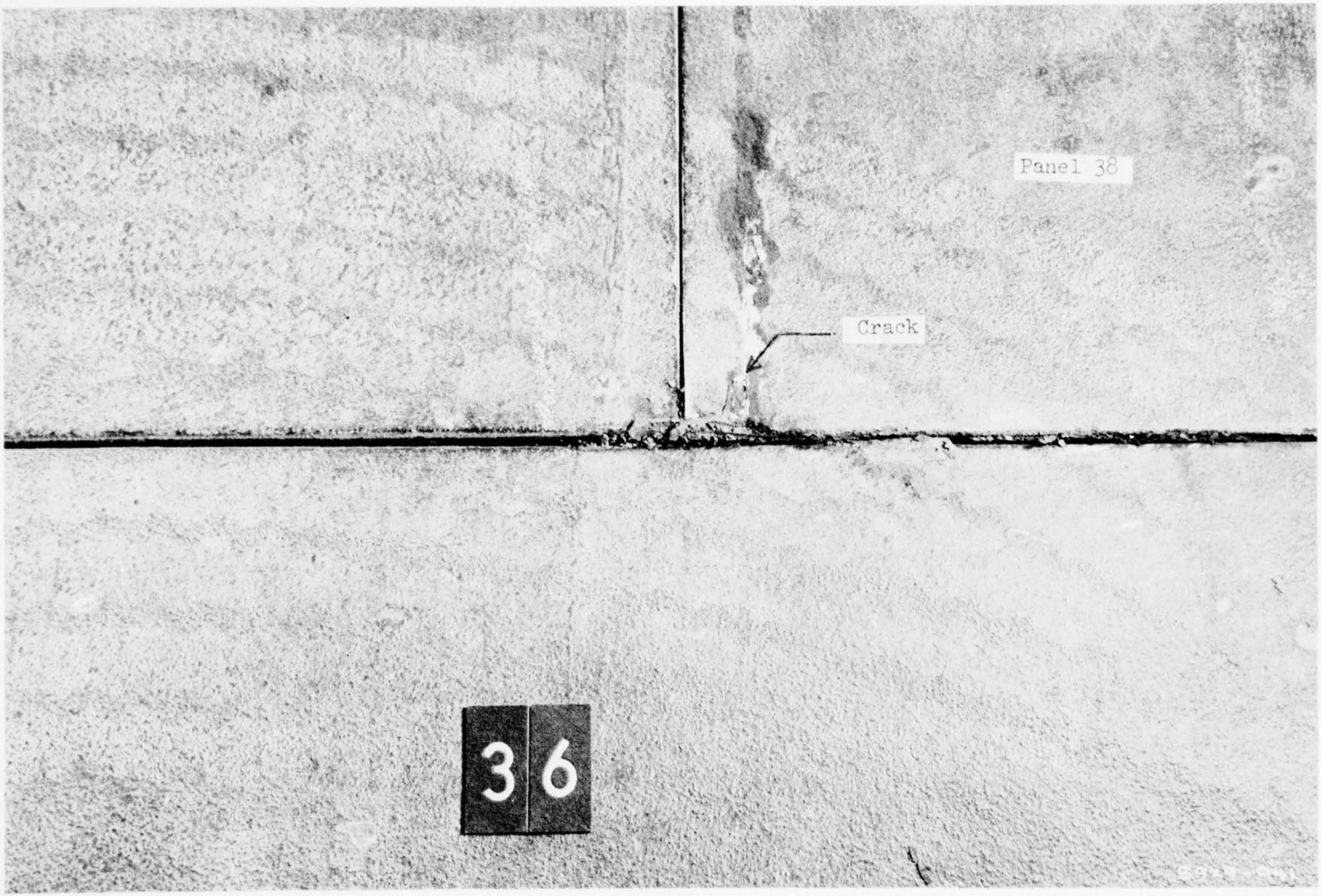
Split in the female connector of panel 4 after 832 coverages, Phase 2

Split in the female connector of panel 8 after 832 coverages, Phase 2

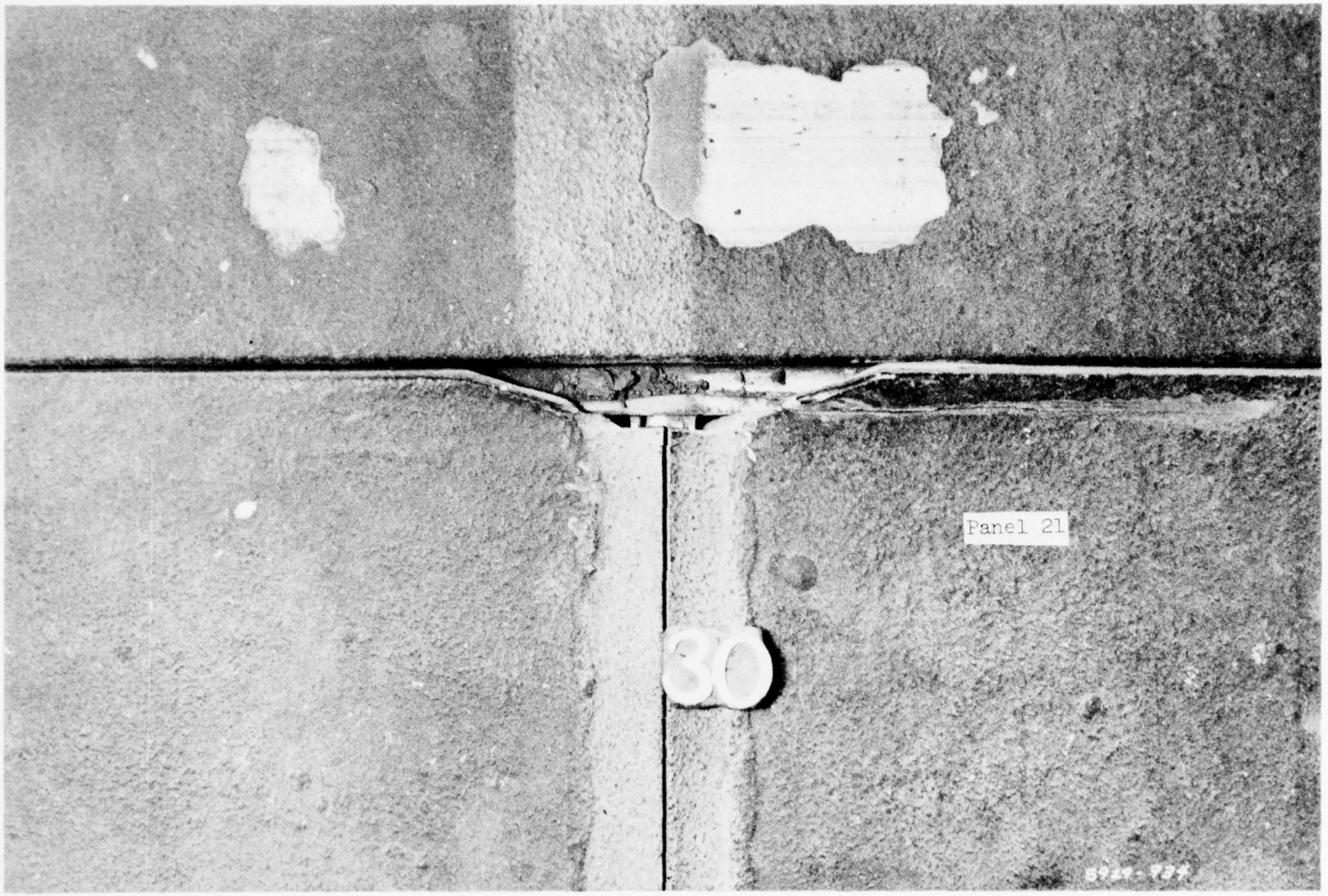
Incl 57



Crack in weld between I-lock and extrusion and split along male connector of panel 8 after 832 coverages, Phase 2



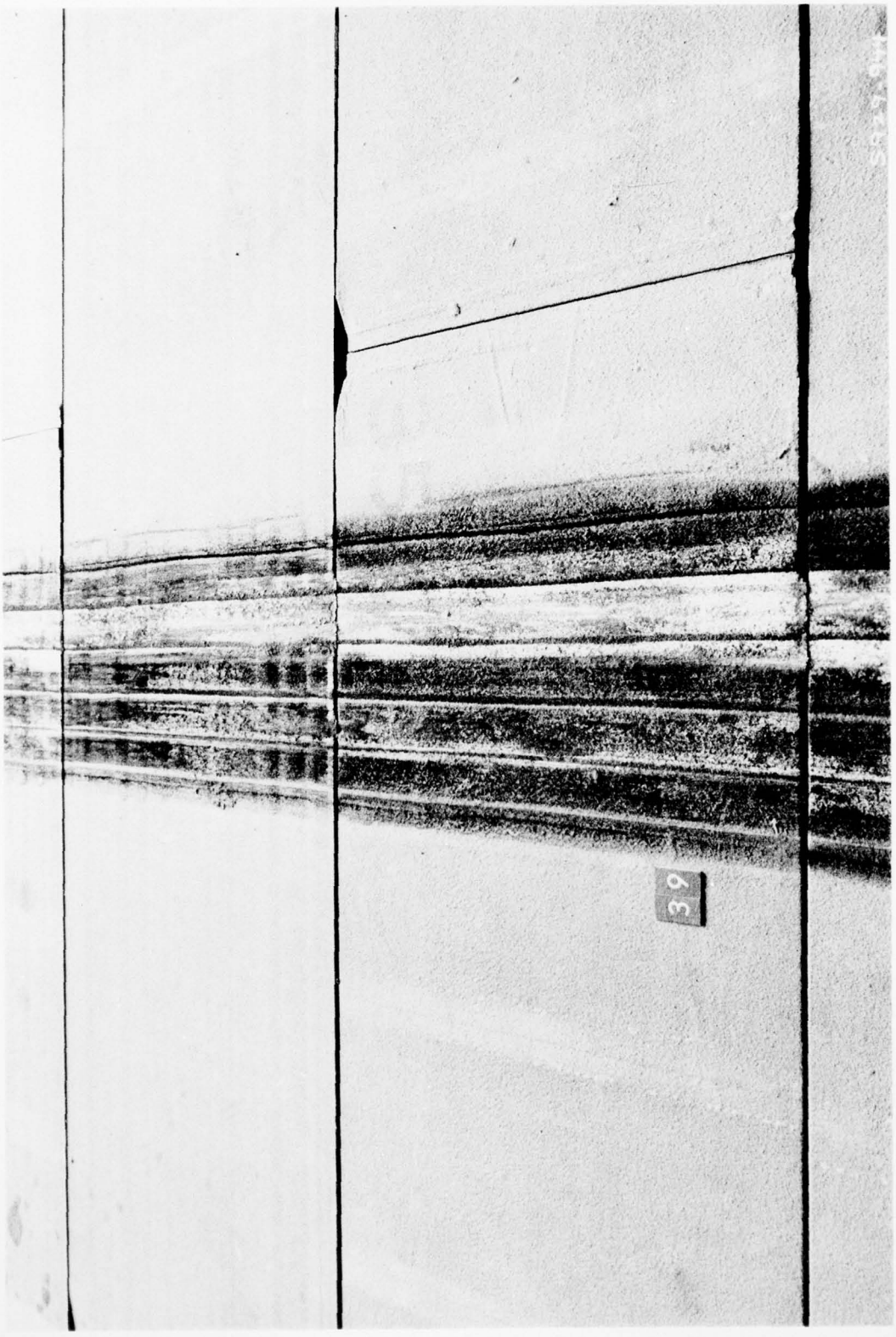
Crack in weld between I-lock connector and extrusion of panel 38 after 832 coverages, Phase 2



Split in the female connector of panel 21

Split in the female connector of panel 36 after 832 coverages, Phase 2

Incl 61

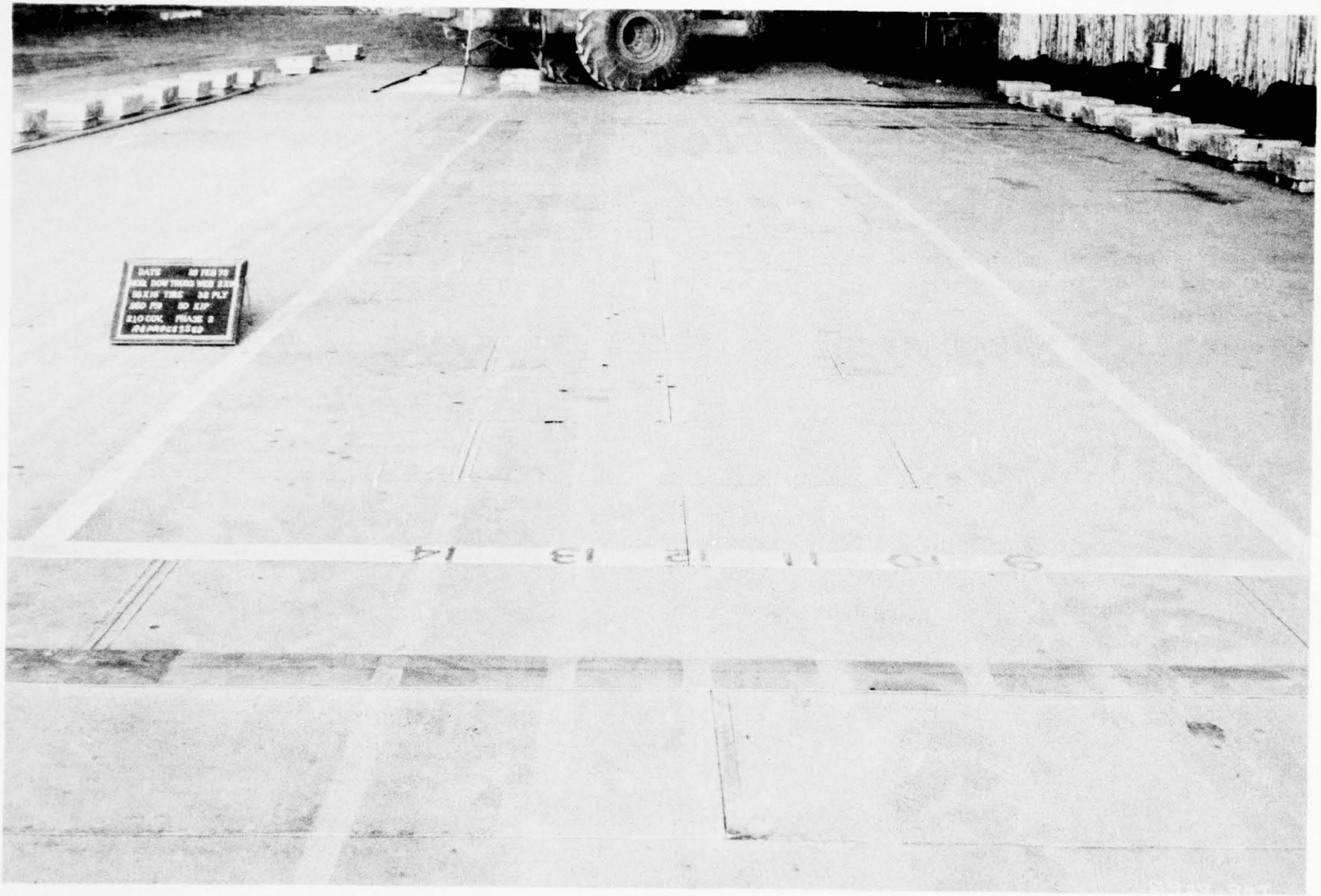


Mat surface after dry skid

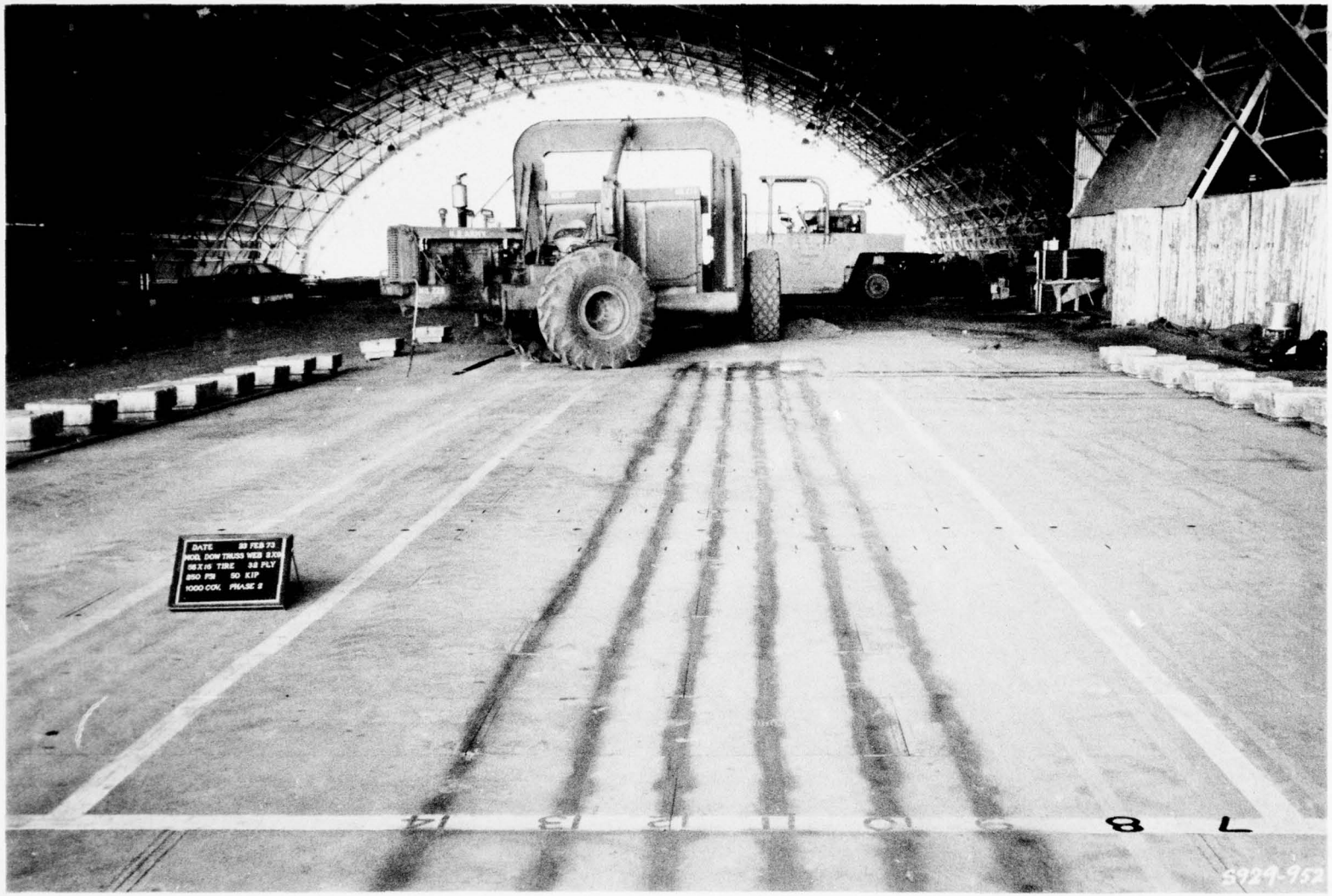
Mat surface after wet skid

Incl 63

Test section at 0 coverages, Phase 2, subgrade reprocessed



Test section after 210 coverages, Phase 2, subgrade reprocessed



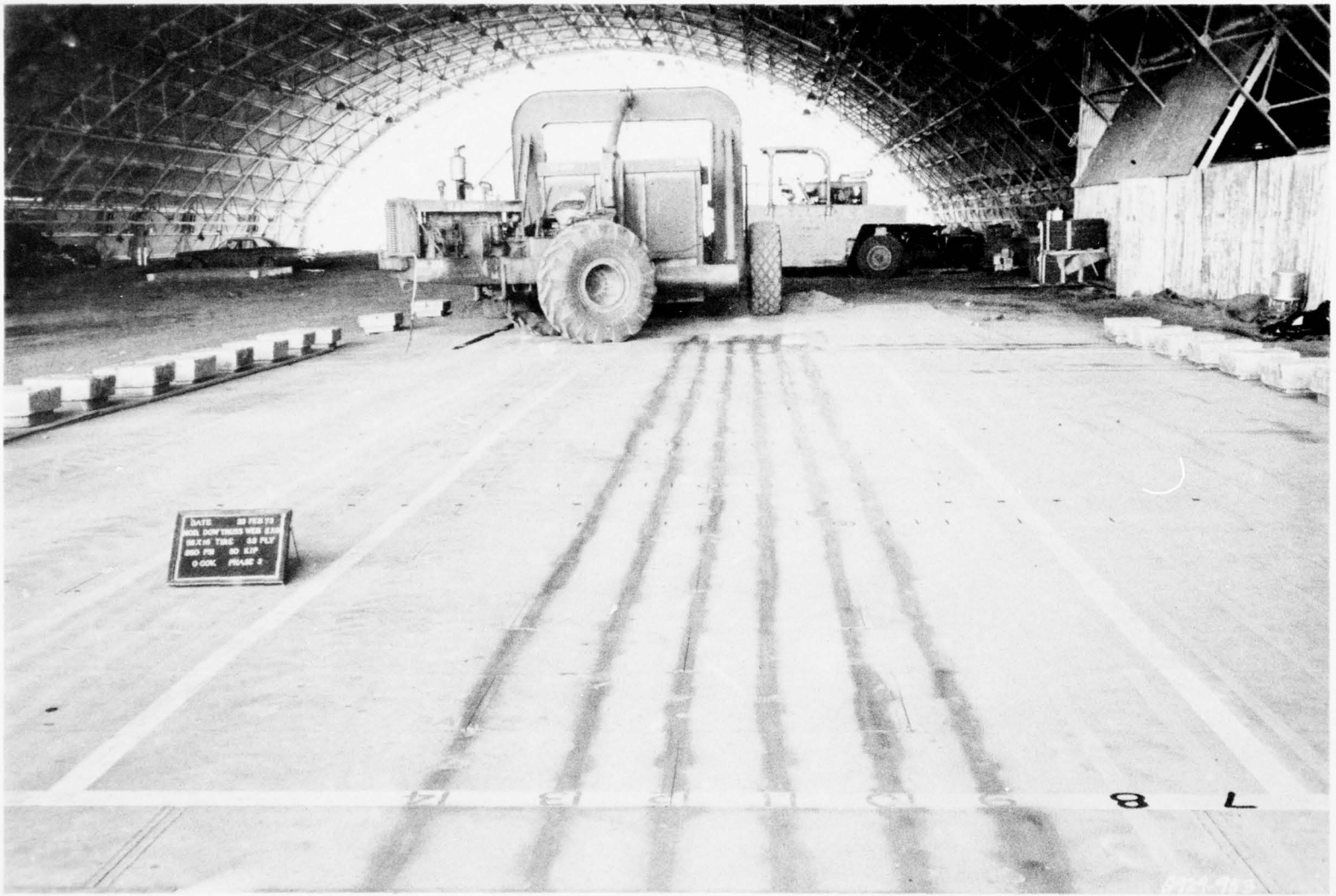
Test section after 1000 coverages, Phase 2, subgrade reprocessed

Split in female connector of panel 8 after 210 coverages, Phase 2, subgrade reprocessed

Incl 67

Crack in weld between I-lock and extrusion and split along male connector of panel 8 after 210 coverages, Phase 2, subgrade reprocessed

Split in female connector (west end) of panel 4 after 210 coverages, Phase 2, subgrade reprocessed

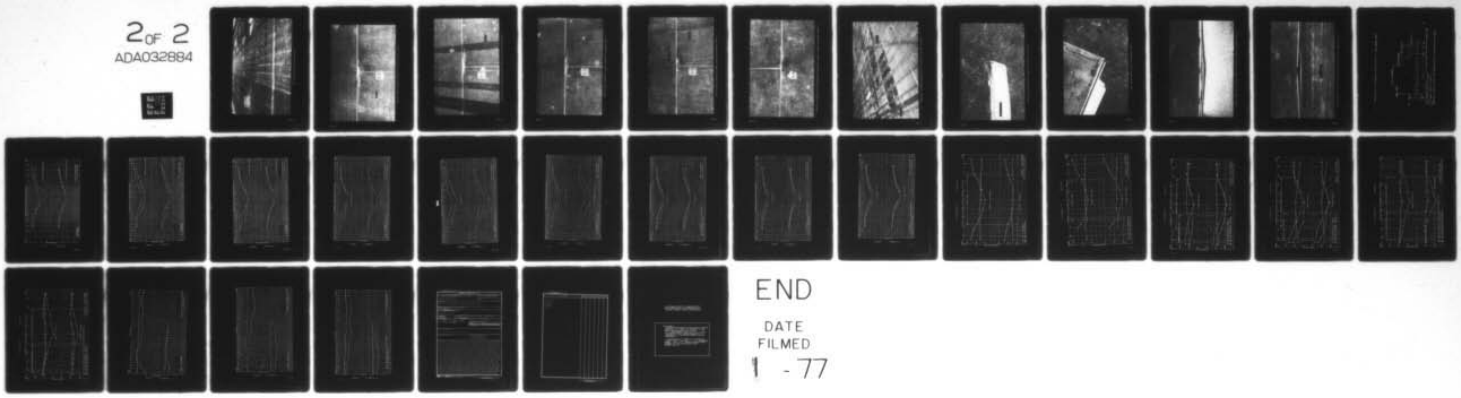


Test section at 0 coverages, Phase 3

AD-A032 884 ARMY ENGINEER WATERWAYS EXPERIMENT STATION VICKSBURG MISS F/G 1/5
EVALUATION OF DOW CHEMICAL PRODUCTION EXTRUDED TRUSS-WEB LANDIN--ETC(U)
MAR 74 D W WHITE

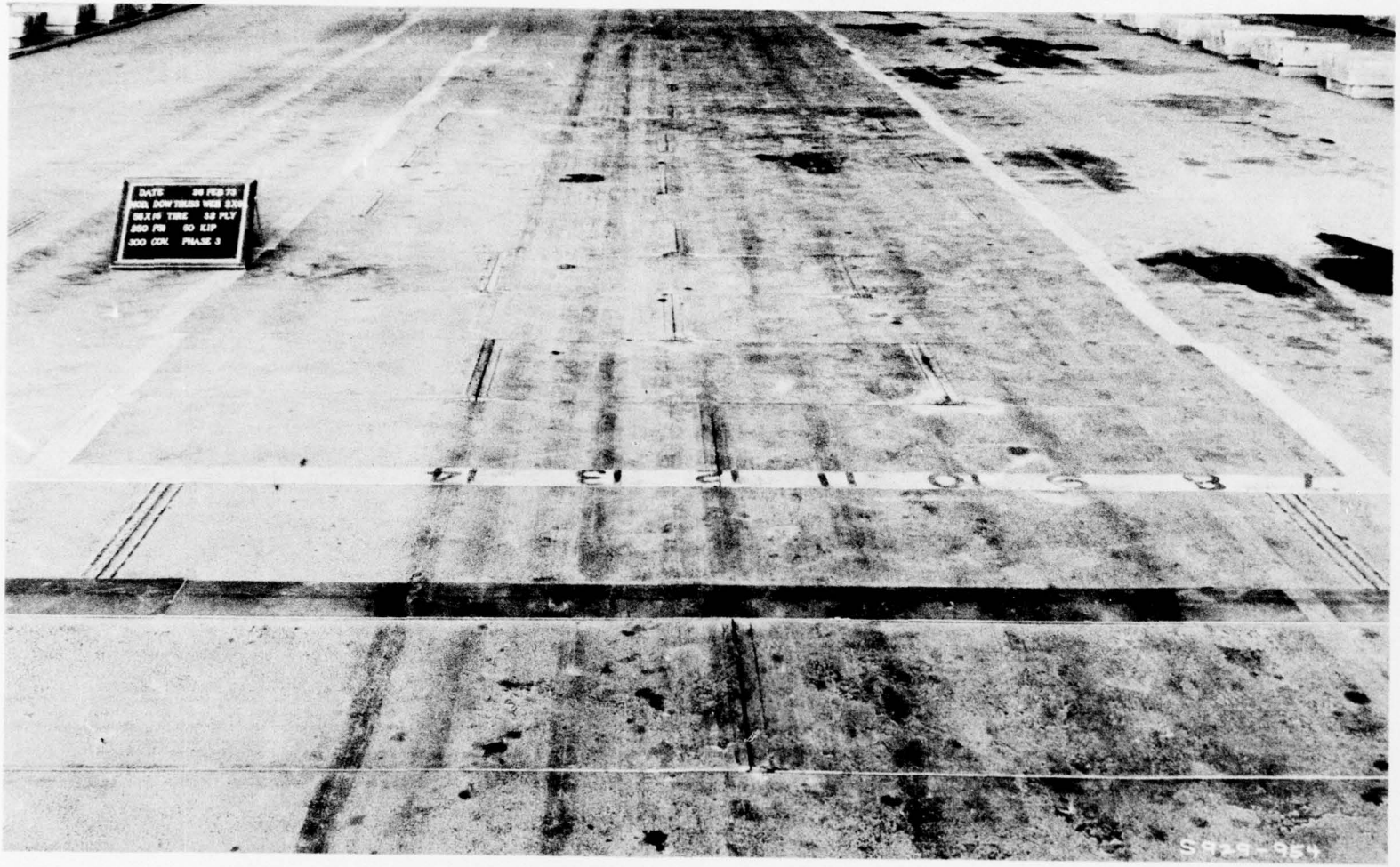
UNCLASSIFIED WES-MP-S-74-6 NL

2 OF 2
ADA032884



END

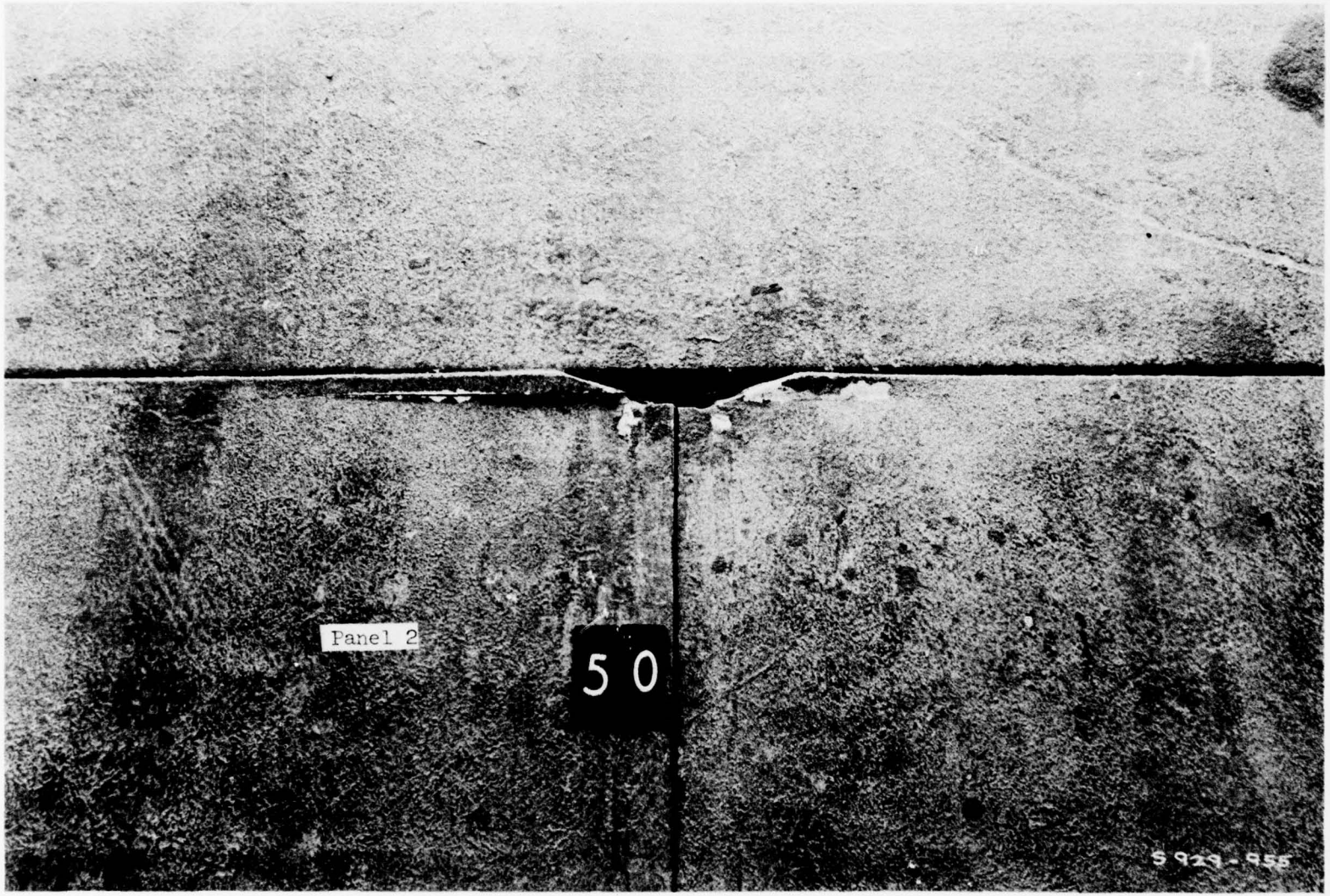
DATE
FILMED
1 - 77



Test section after 300 coverages, Phase 3

Incl 71

Incl 72

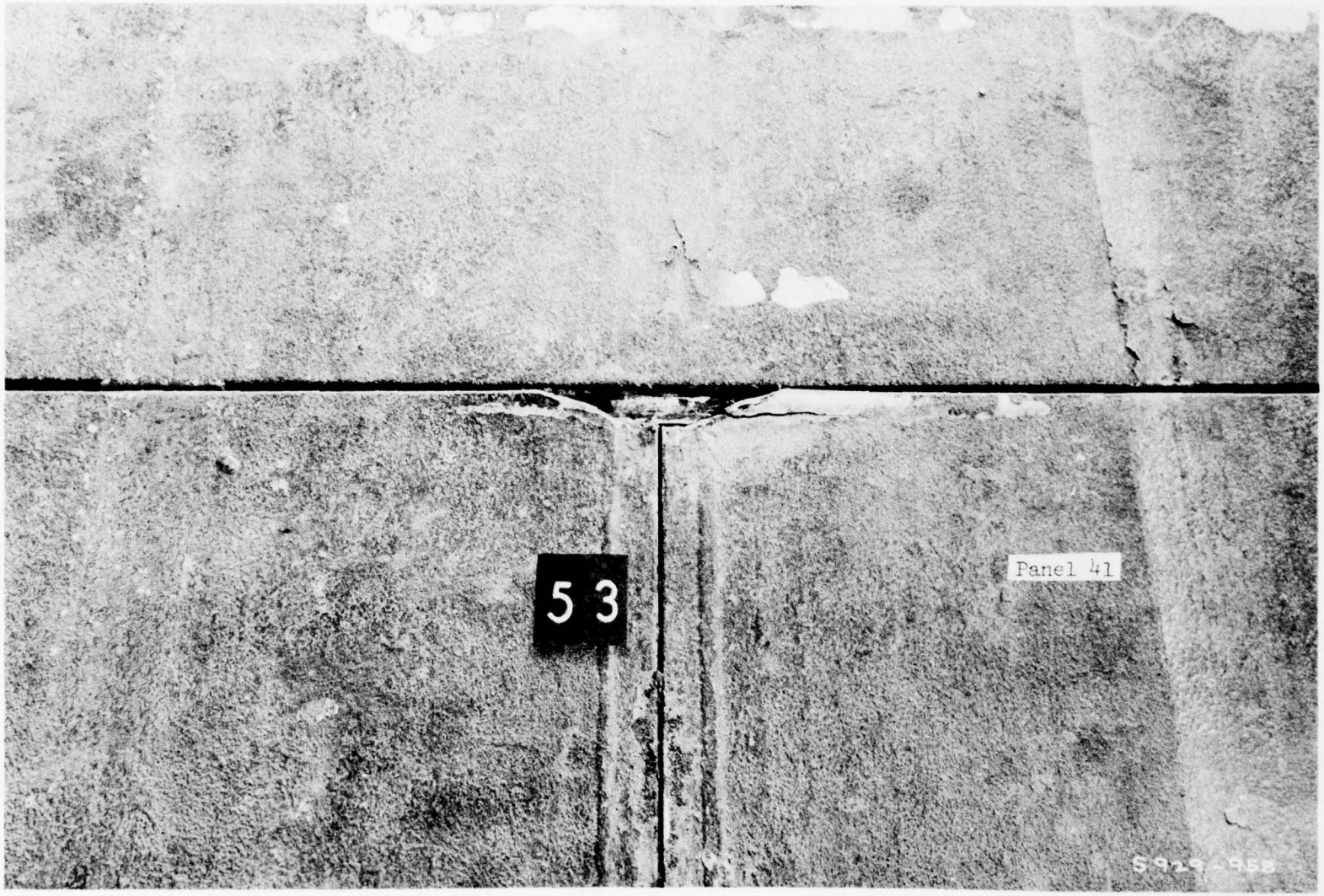


Split in female connector of panel 2 after 300 coverages, Phase 3

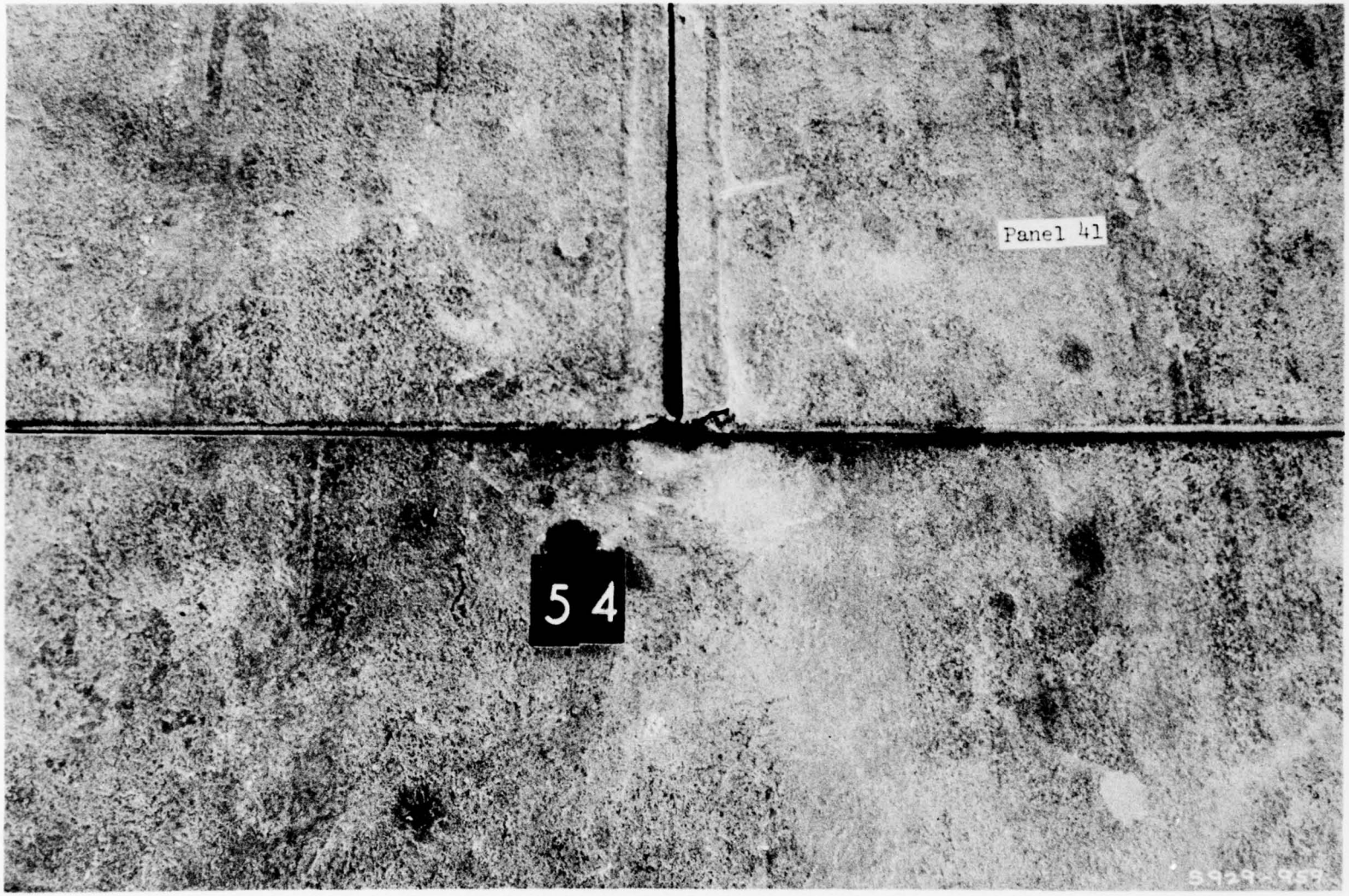
Split in female connector (east end) of panel 4 after 300 coverages, Phase 3

Incl 73

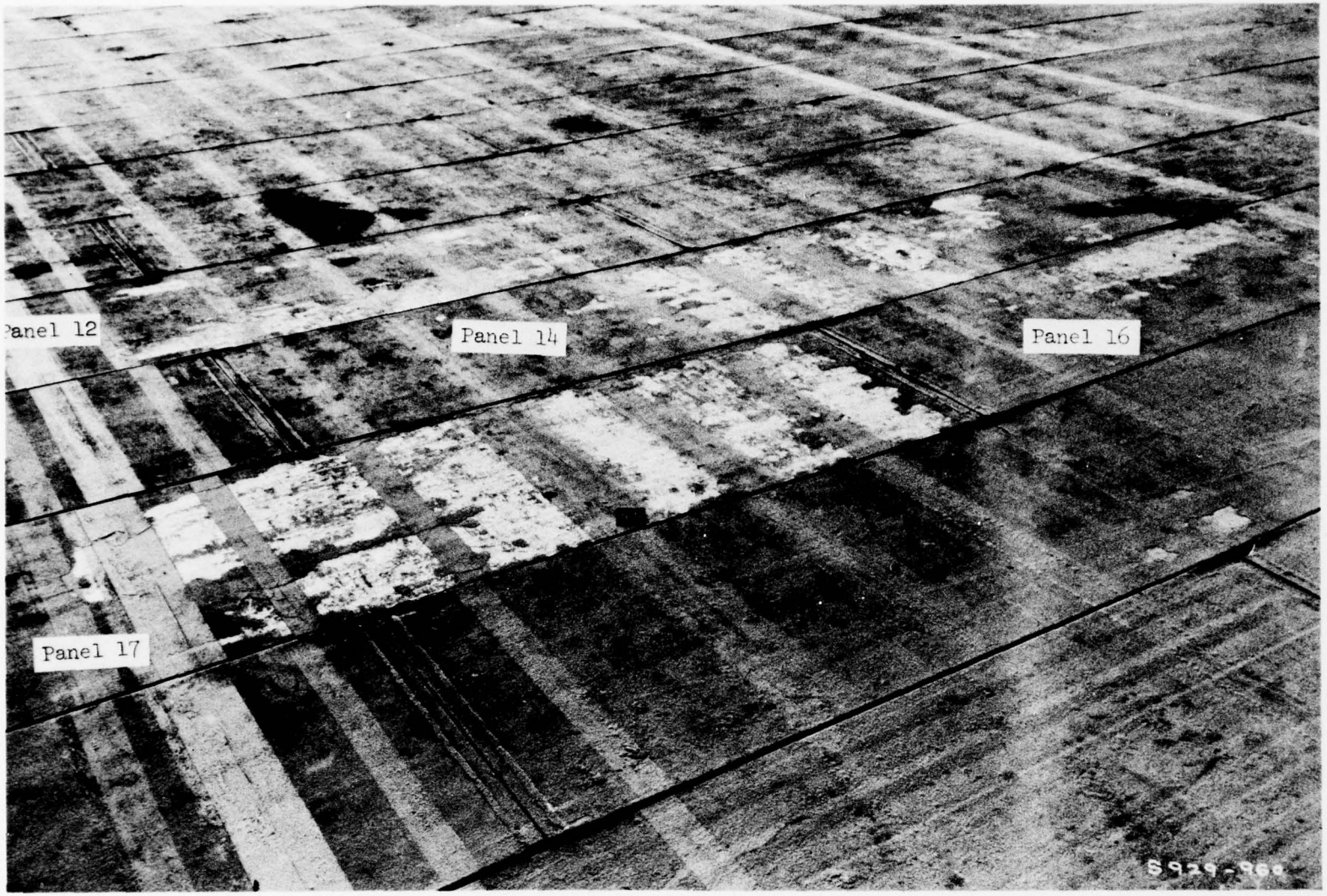
Split in female connector of panel 36 after 300 coverages, Phase 3



Split in female connector of panel 41 after 300 coverages, Phase 3

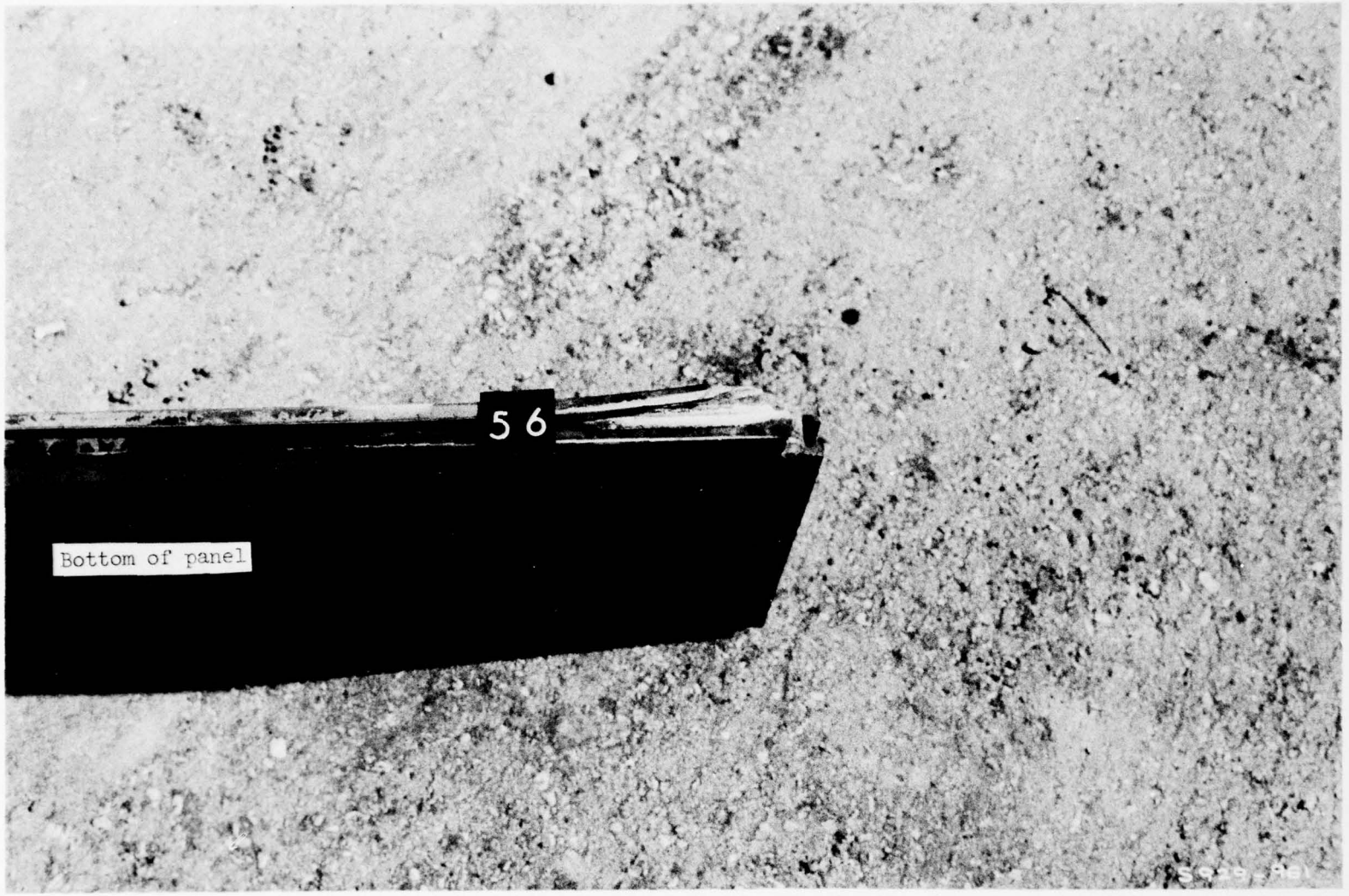


Crack in weld between I-lock and extrusion at male side of panel 41 after 300 coverages, Phase 3

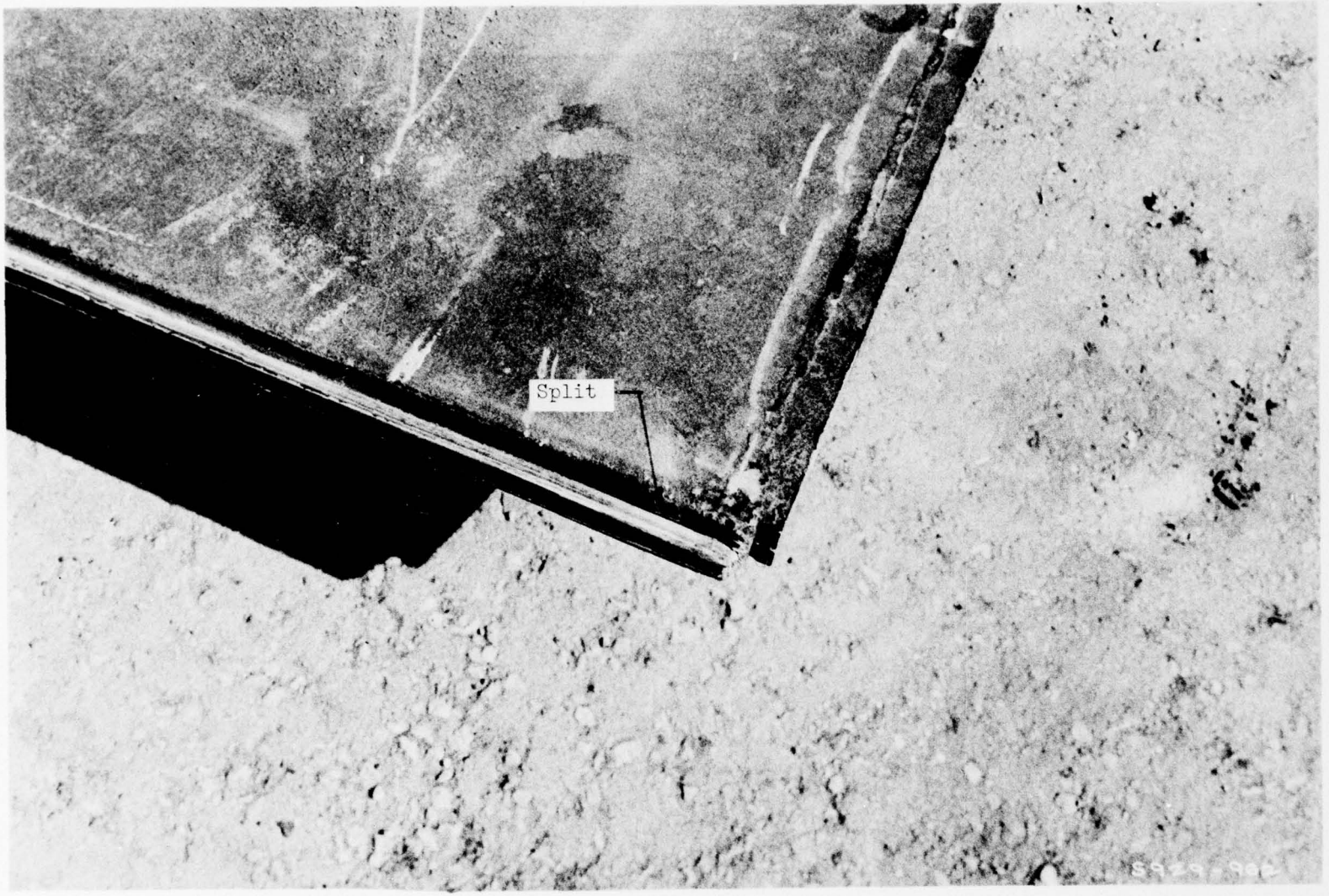


Condition of antiskid on panels 12, 14, 16, and 17 at the end of traffic

Incl 77

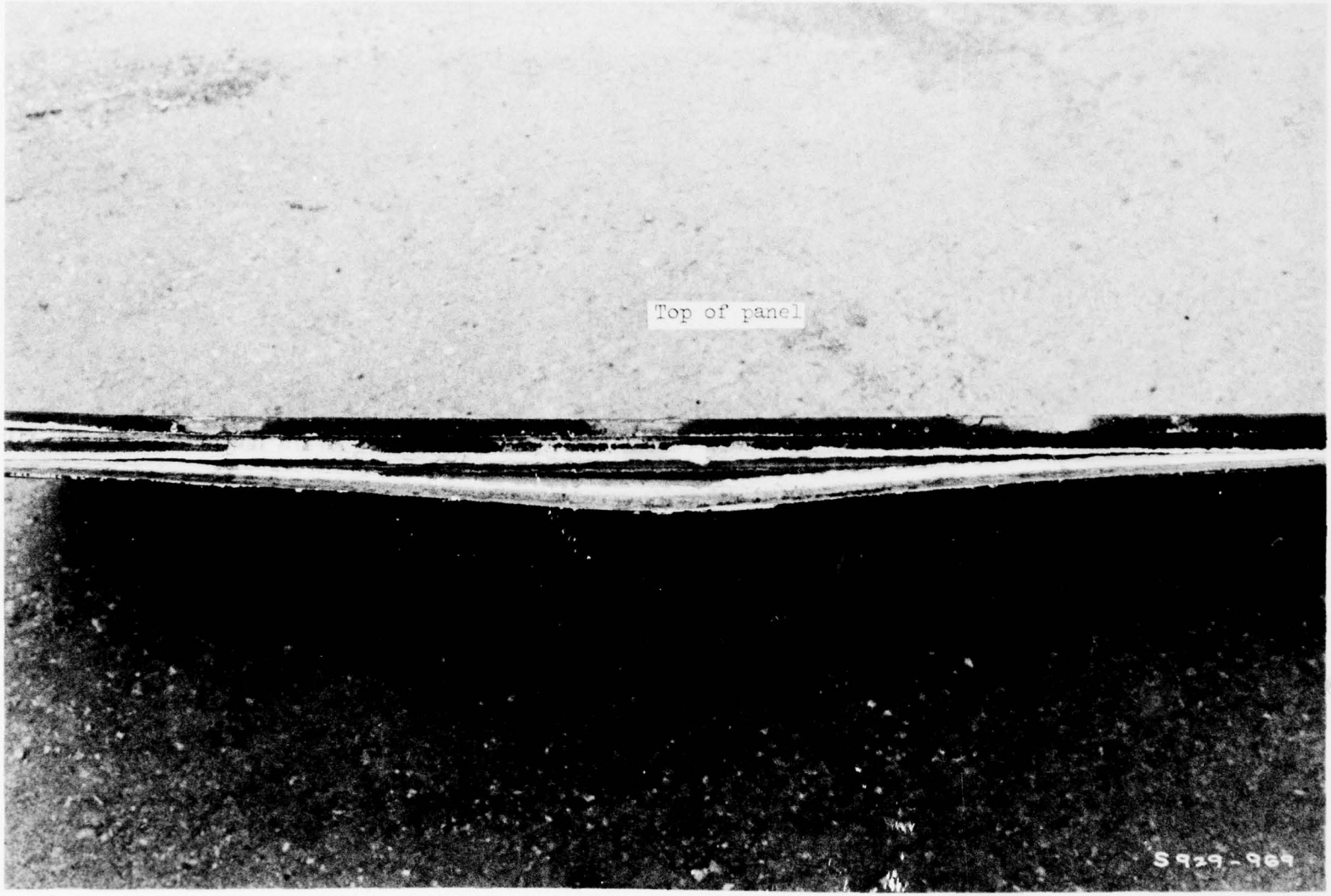


Typical panel failure due to a split at the female I-lock corner

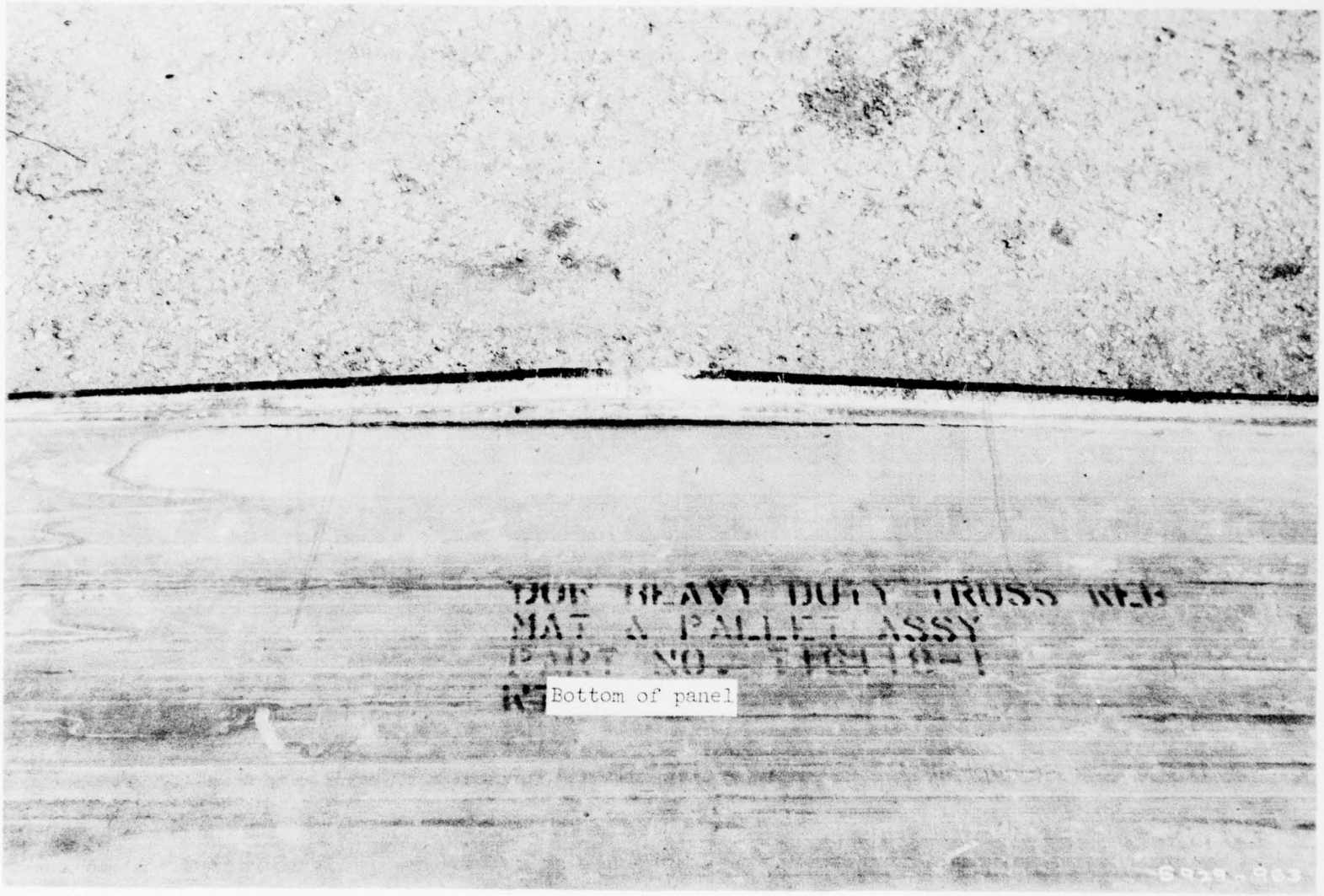


Split in male connector after 300 coverages, Phase 3

Incl 79



Split in slart rib of the female connector of panel 2 after 300 coverages, Phase 3

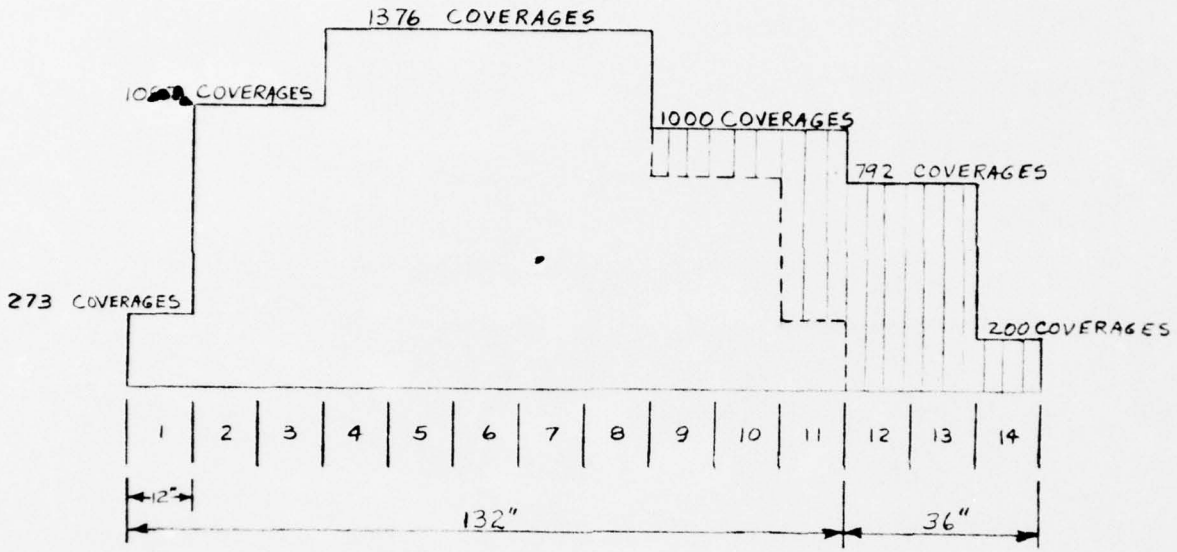


Split in bottom of panel 2 near the female connector after 300 coverages, Phase 3

Incl 81

Incl 82

RATED TRAFFIC FOR MODIFIED PRODUCTION TRUSS WEB LANDING MAT*

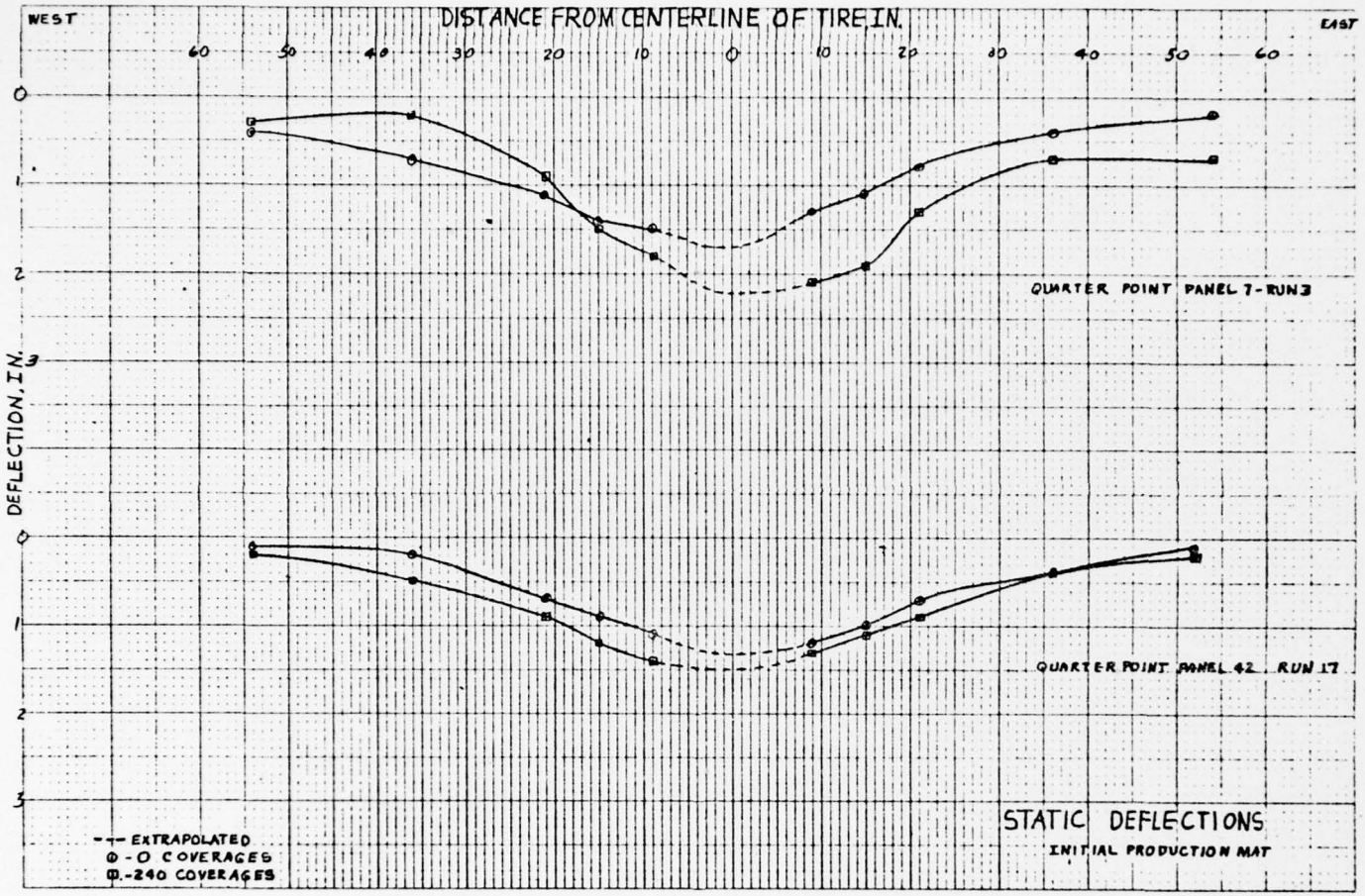


* COVERAGES ON SUBGRADE WITH STRENGTH RATED 4 CBR (SEE INCL. 54 FOR ACTUAL COVERAGES APPLIED)

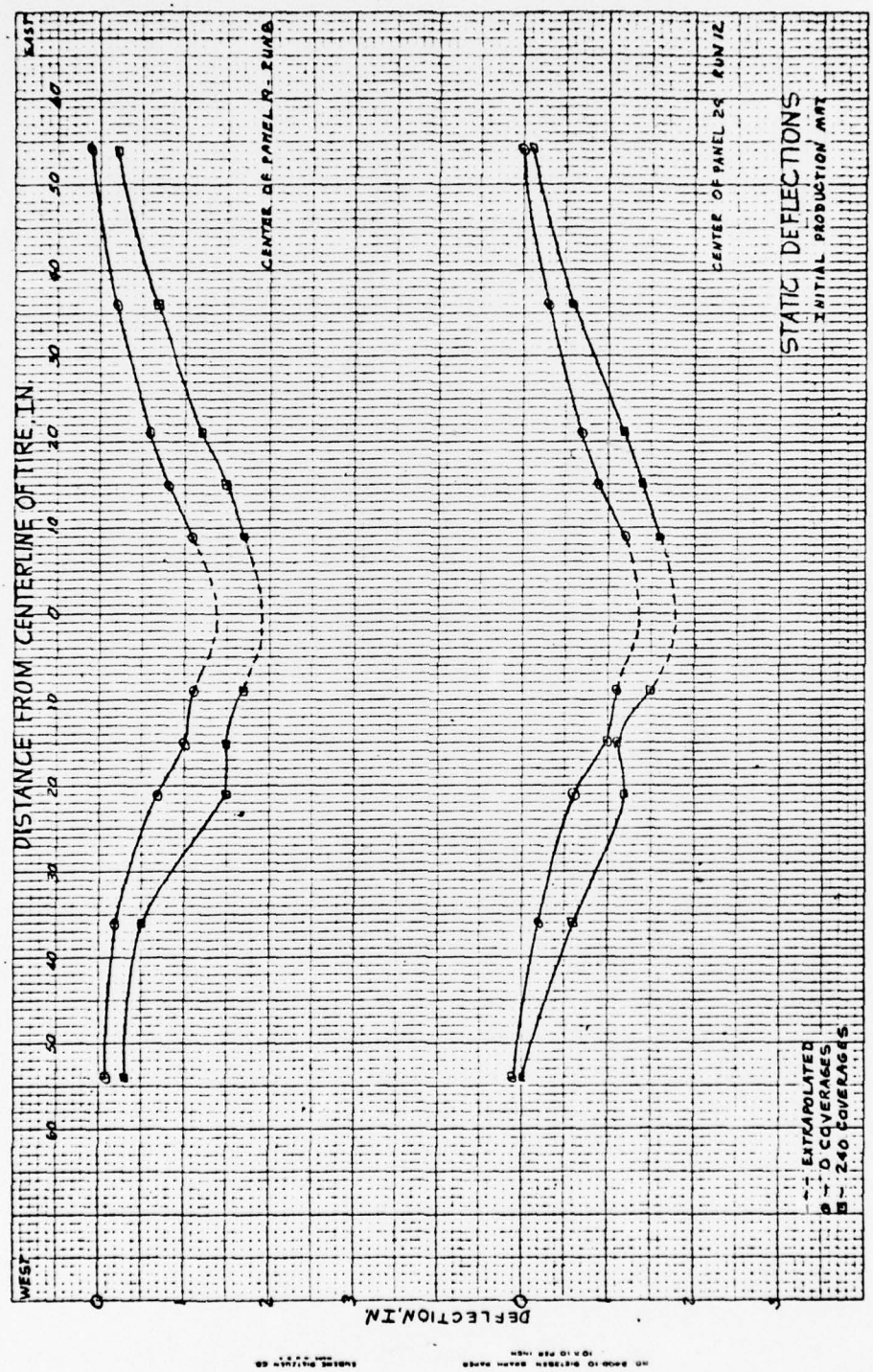
- .02 INCH EQUALS 100 COVERAGES

STANDARD TRAFFIC COVERAGES

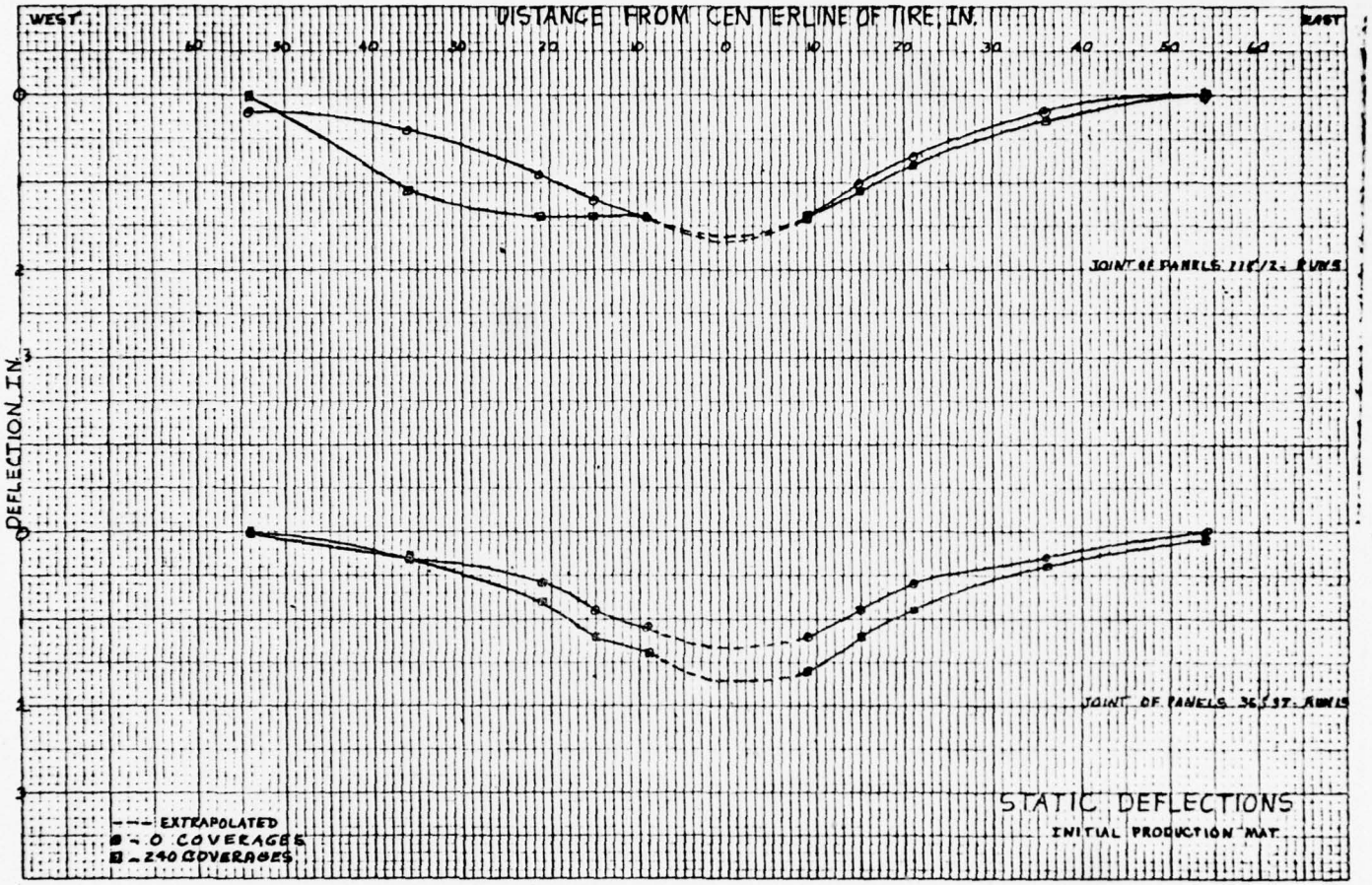
ADDED IN ORDER TO SUBJECT MORE PANEL END JOINTS TO A MINIMUM OF 1000 COVERAGES


WEST
DISTANCE FROM CENTERLINE OF TIRE, IN.
EAST
60
50
40
30
20
10
0
10
20
30
40
50
60
DEFLECTION, IN.
0
1
2
3
QUARTER POINT PANEL 7 - RUN 3
QUARTER POINT PANEL 42 - RUN 17
-+- EXTRAPOLATED
⊕ - 0 COVERAGES
⊕ - 240 COVERAGES
STATIC DEFLECTIONS
INITIAL PRODUCTION MAT

Incl 83

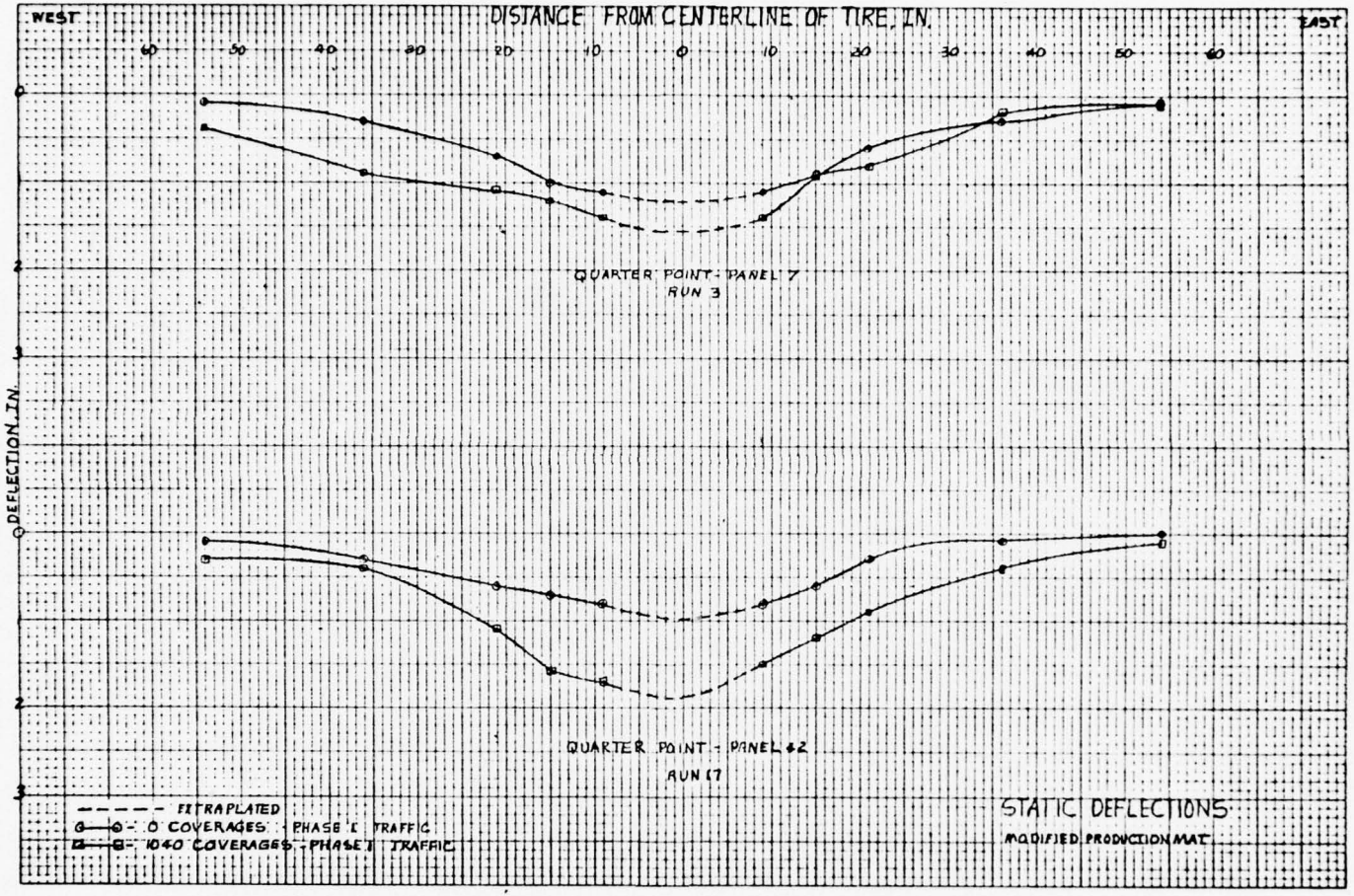

STATIC DEFLECTIONS
INITIAL PRODUCTION MAT
CENTER OF PANEL 29 RUN 12
CENTER OF PANEL R-RUN 8
DISTANCE FROM CENTERLINE OF TIRE, IN.
DEFLECTION, IN
WEST
EAST
EXTRAPOLATED
0 COVERAGES
240 COVERAGES

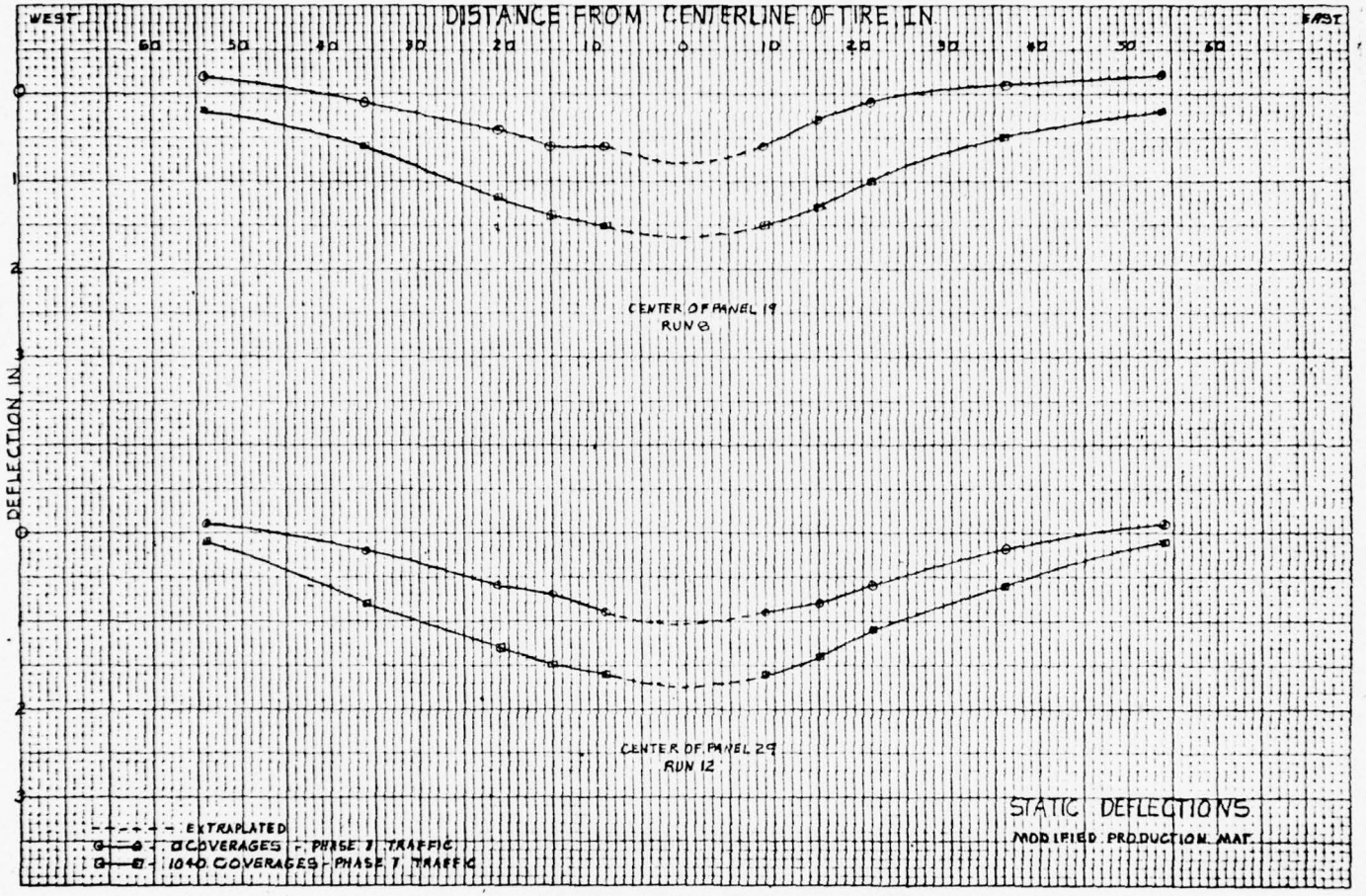
Incl 83


WEST
DISTANCE FROM CENTERLINE OF TIRE, IN.
EAST
60
50
40
30
20
10
0
10
20
30
40
50
60
DEFLECTION, IN.
0
1
2
3
JOINT OF PANELS 31 & 32 - RUN 5
JOINT OF PANELS 36 & 37 - RUN 15
--- EXTRAPOLATED
0 - 0 COVERAGES
240 COVERAGES
STATIC DEFLECTIONS
INITIAL PRODUCTION MAT.

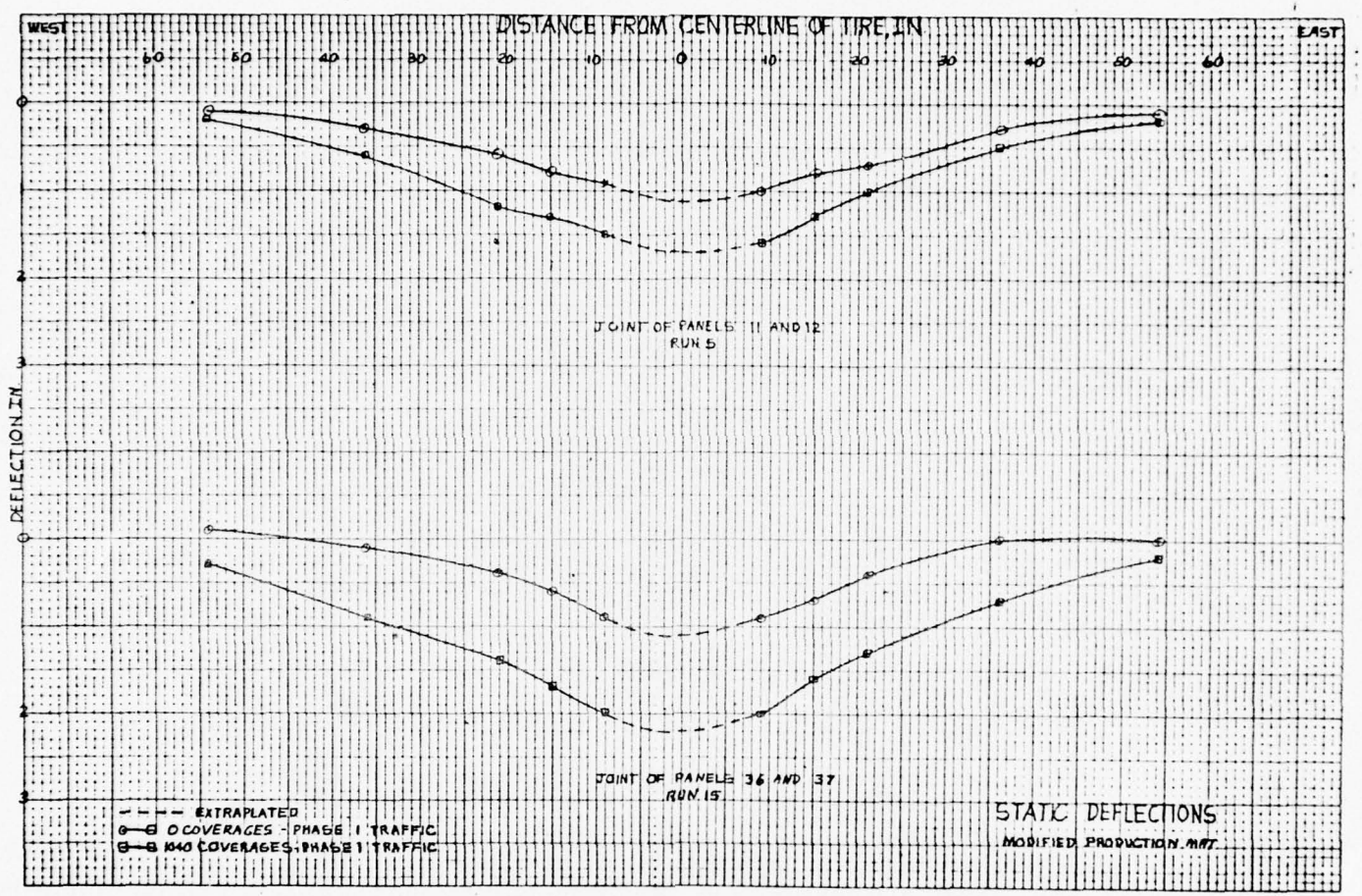
Incl 83

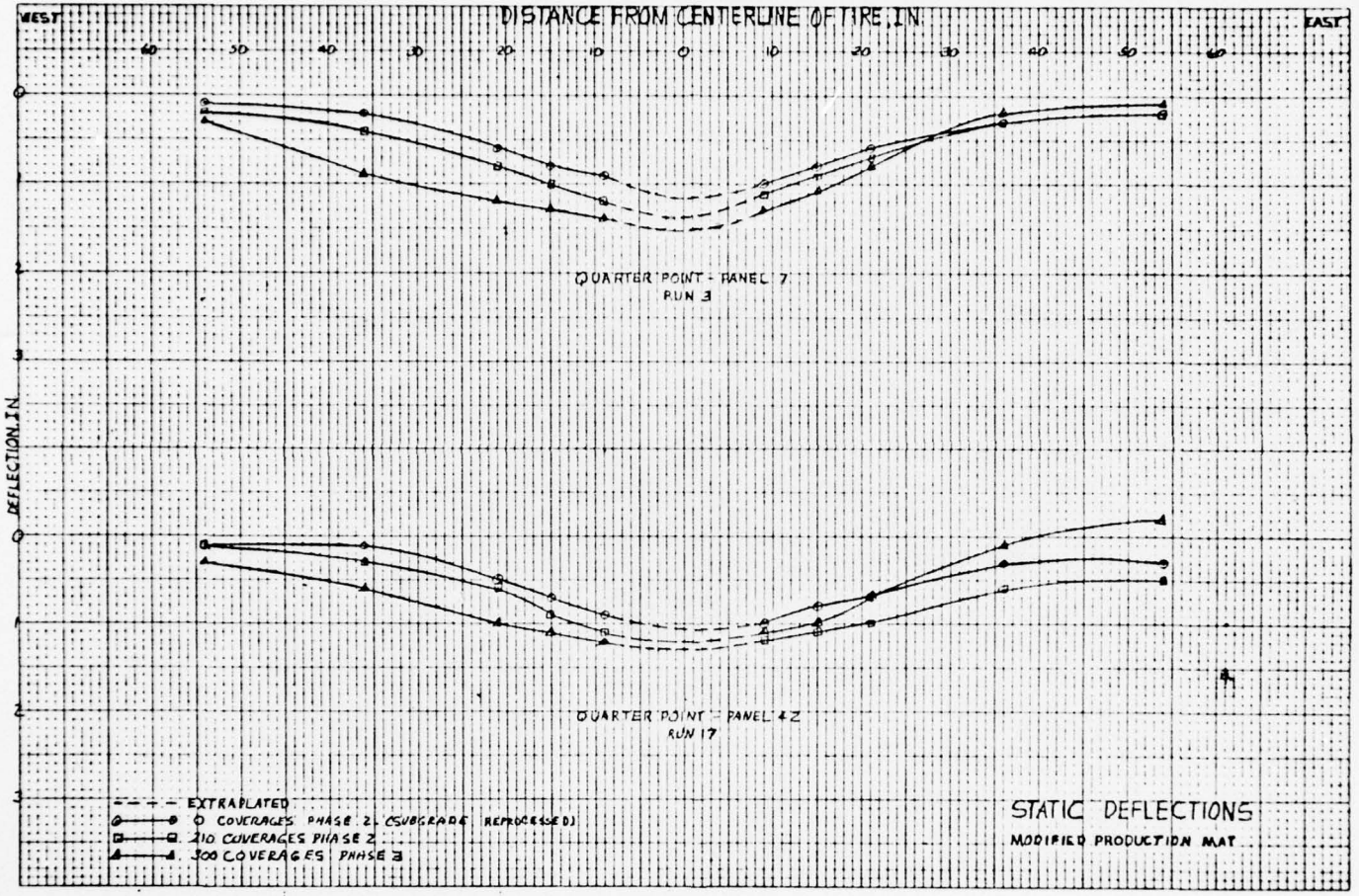
Incl 84


WEST
DISTANCE FROM CENTERLINE OF TIRE, IN.
EAST
60
50
40
30
20
10
0
10
20
30
40
50
60
DEFLECTION, IN.
0
1
2
3
QUARTER POINT - PANEL 7
RUN 3
QUARTER POINT - PANEL 62
RUN 17
EXTRAPLATED
0 COVERAGES - PHASE I TRAFFIC
1040 COVERAGES - PHASE I TRAFFIC
STATIC DEFLECTIONS
MODIFIED PRODUCTION MAT


WEST
DISTANCE FROM CENTERLINE OF TIRE, IN.
EAST
60
50
40
30
20
10
0
10
20
30
40
50
60
DEFLECTION, IN.
0
1
2
3
CENTER OF PANEL 19
RUN 8
CENTER OF PANEL 29
RUN 12
EXTRAPLATED
0—0 - 0 COVERAGES - PHASE I TRAFFIC
0—0 - 1040 COVERAGES - PHASE I TRAFFIC
STATIC DEFLECTIONS
MODIFIED PRODUCTION MAT.

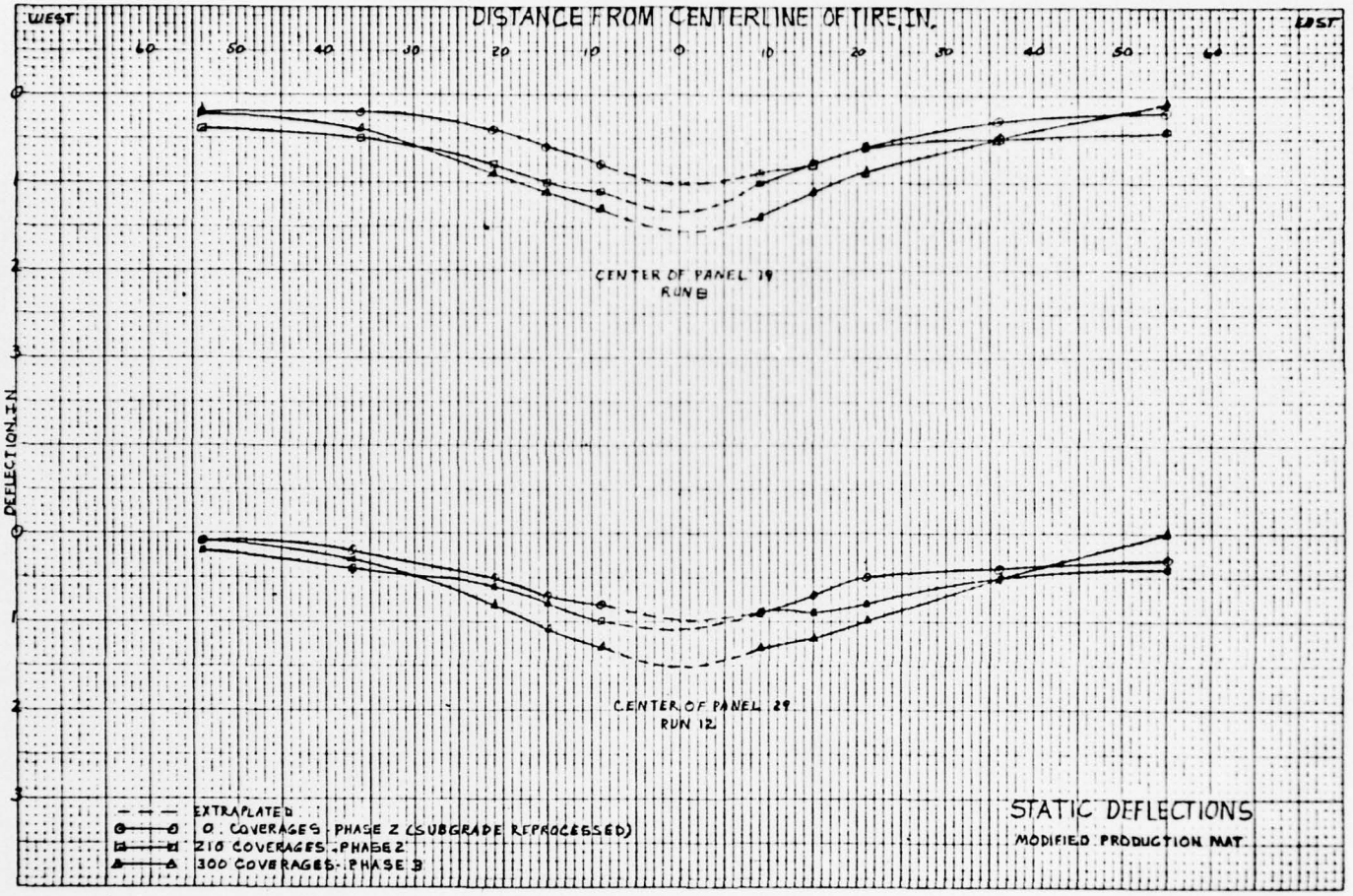
Incl 84

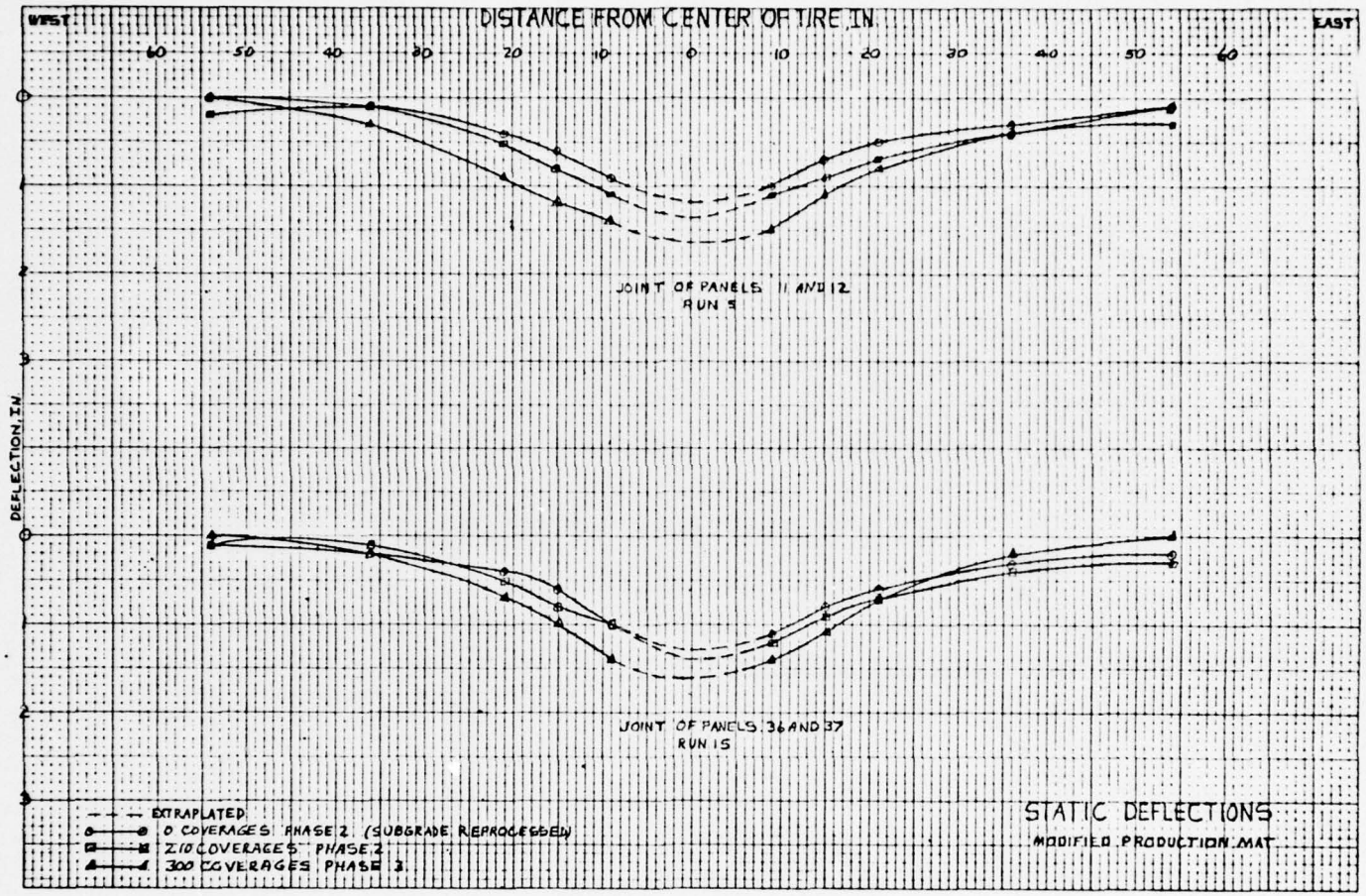

WEST
EAST
DISTANCE FROM CENTERLINE OF TIRE, IN
60
50
40
30
20
10
0
10
20
30
40
50
60
DEFLECTION IN
0
2
3
JOINT OF PANELS 11 AND 12
RUN 5
JOINT OF PANELS 36 AND 37
RUN 15
EXTRAPLATED
0 COVERAGES - PHASE 1 TRAFFIC
1040 COVERAGES, PHASE 1 TRAFFIC
STATIC DEFLECTIONS
MODIFIED PRODUCTION MAT


DISTANCE FROM CENTERLINE OF TIRE, IN.
WEST
EAST
60
50
40
30
20
10
0
10
20
30
40
50
60
DEFLECTION, IN.
0
1
2
3
QUARTER POINT - PANEL 7
RUN 3
QUARTER POINT - PANEL 42
RUN 17
EXTRAPLATED
0 COVERAGES PHASE 2 (SUBGRADE REPROCESSED)
210 COVERAGES PHASE 2
300 COVERAGES PHASE 3
STATIC DEFLECTIONS
MODIFIED PRODUCTION MAT

Incl 84

Incl 84

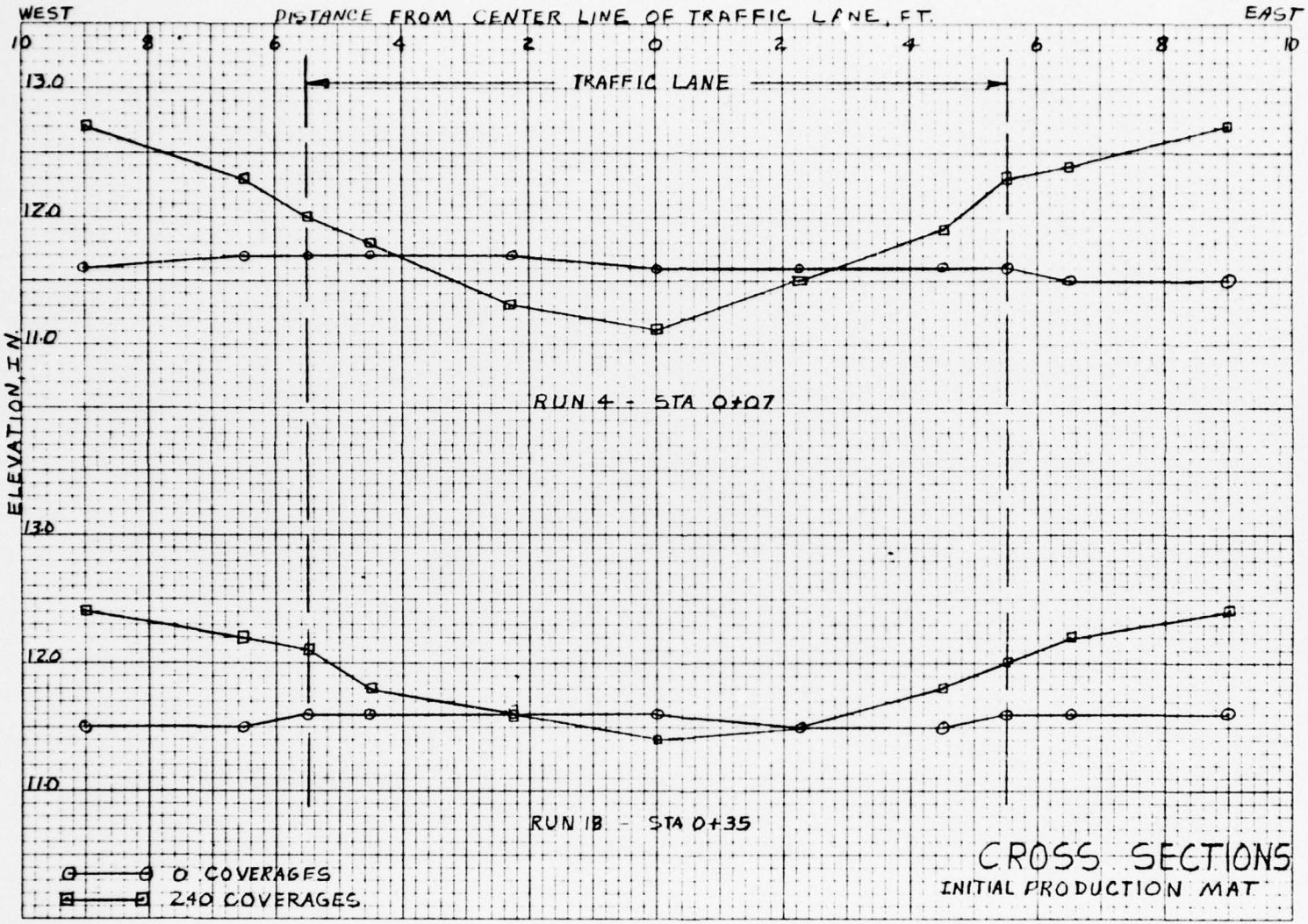

WEST
DISTANCE FROM CENTERLINE OF TIRE, IN.
EAST
60
50
40
30
20
10
0
10
20
30
40
50
60
DEFLECTION, IN.
0
1
2
3
CENTER OF PANEL 29
RUN 8
CENTER OF PANEL 29
RUN 12
EXTRAPLATED
0 COVERAGES - PHASE 2 (SUBGRADE REPROCESSED)
210 COVERAGES - PHASE 2
300 COVERAGES - PHASE 3
STATIC DEFLECTIONS
MODIFIED PRODUCTION MAT.


DISTANCE FROM CENTER OF TIRE IN.
WEST
EAST
60
50
40
30
20
10
0
10
20
30
40
50
60
DEFLECTION IN
JOINT OF PANELS 11 AND 12
RUN 5
JOINT OF PANELS 36 AND 37
RUN 15
EXTRAPLATED
0 COVERAGES PHASE 2 (SUBGRADE REPROCESSED)
210 COVERAGES PHASE 2
300 COVERAGES PHASE 3
STATIC DEFLECTIONS
MODIFIED PRODUCTION MAT

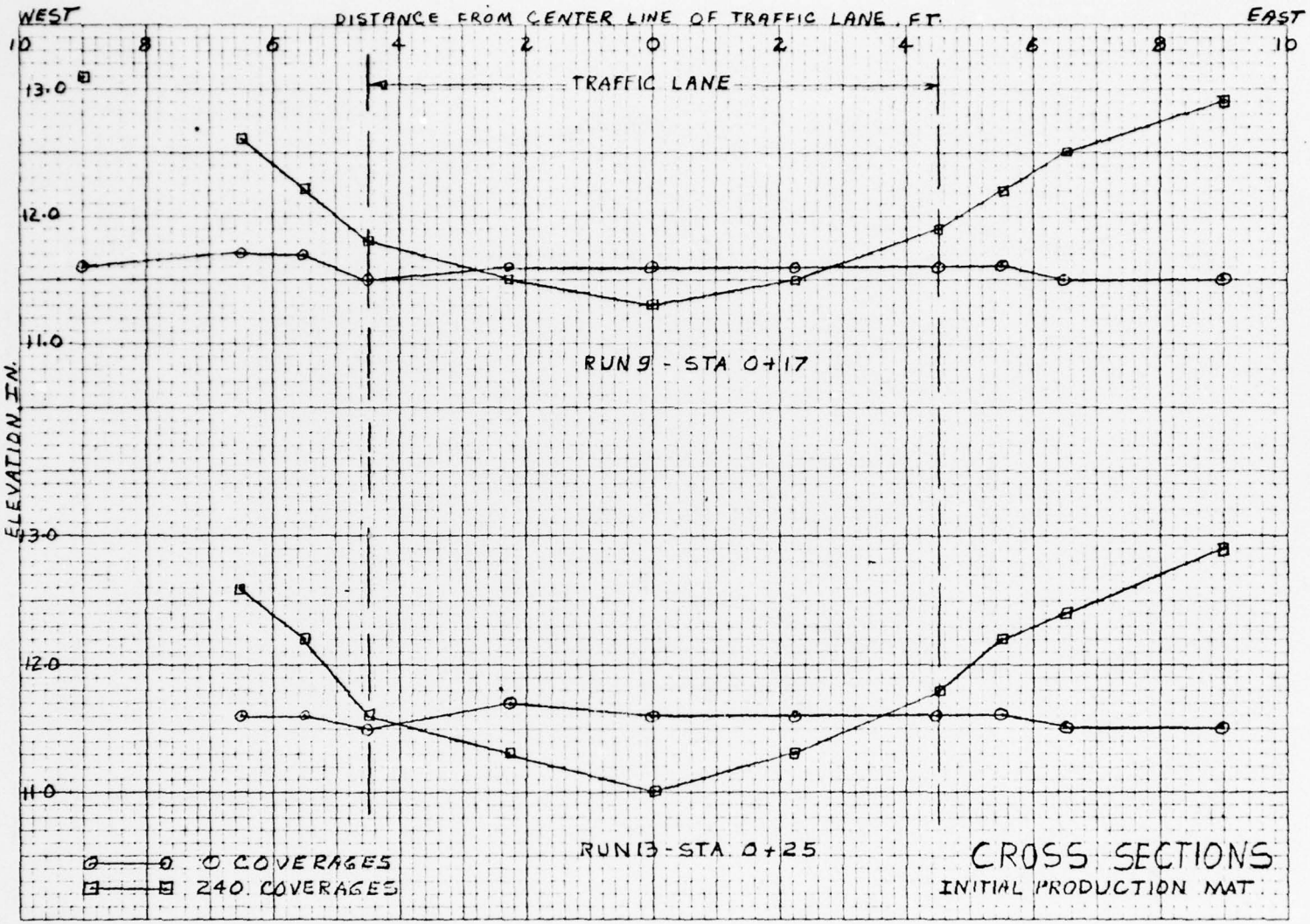
Incl 84

NO. 340-10 DIETZGEN GRAPH PAPER
10 X 10 PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.



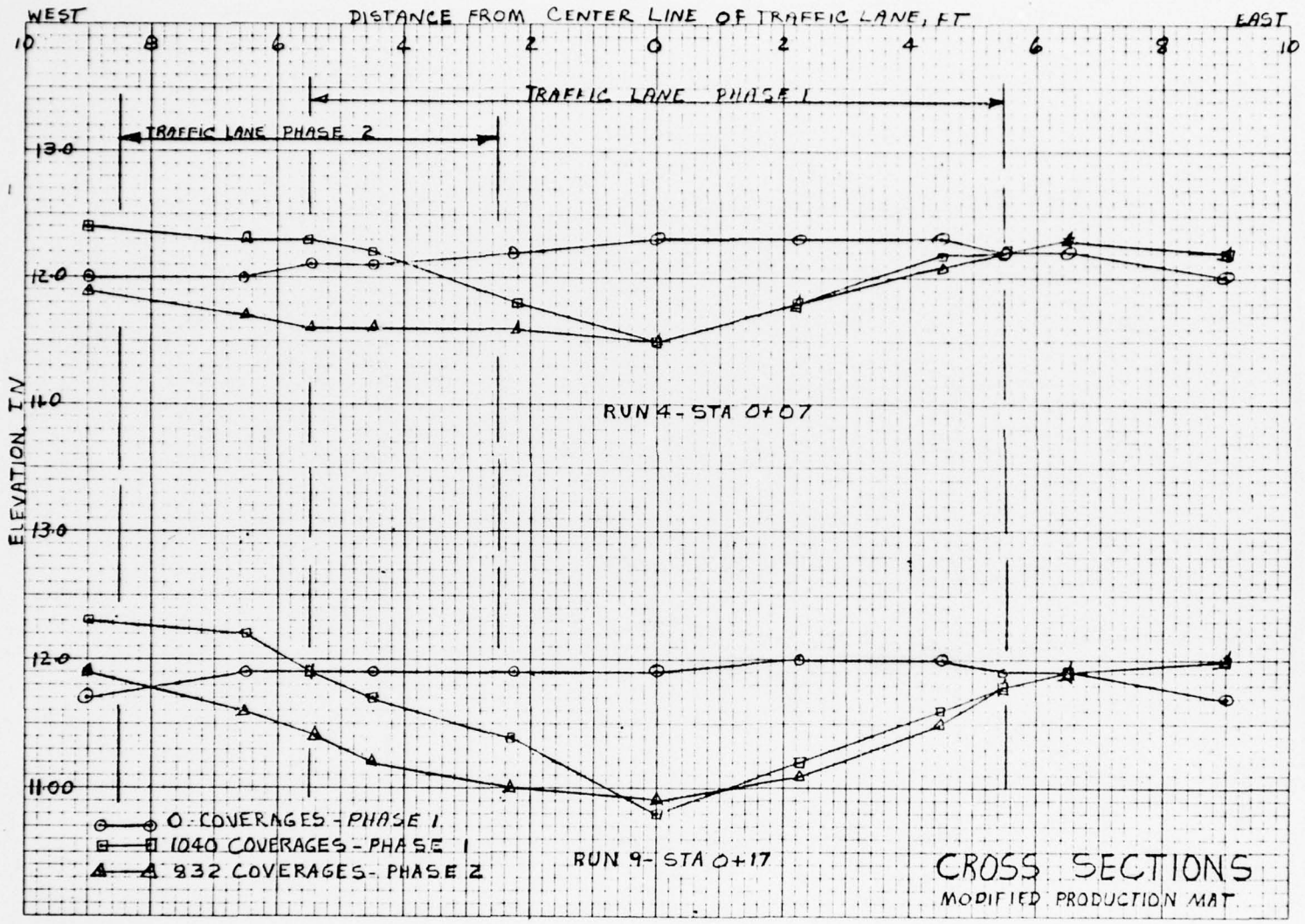
CROSS SECTIONS
INITIAL PRODUCTION MAT



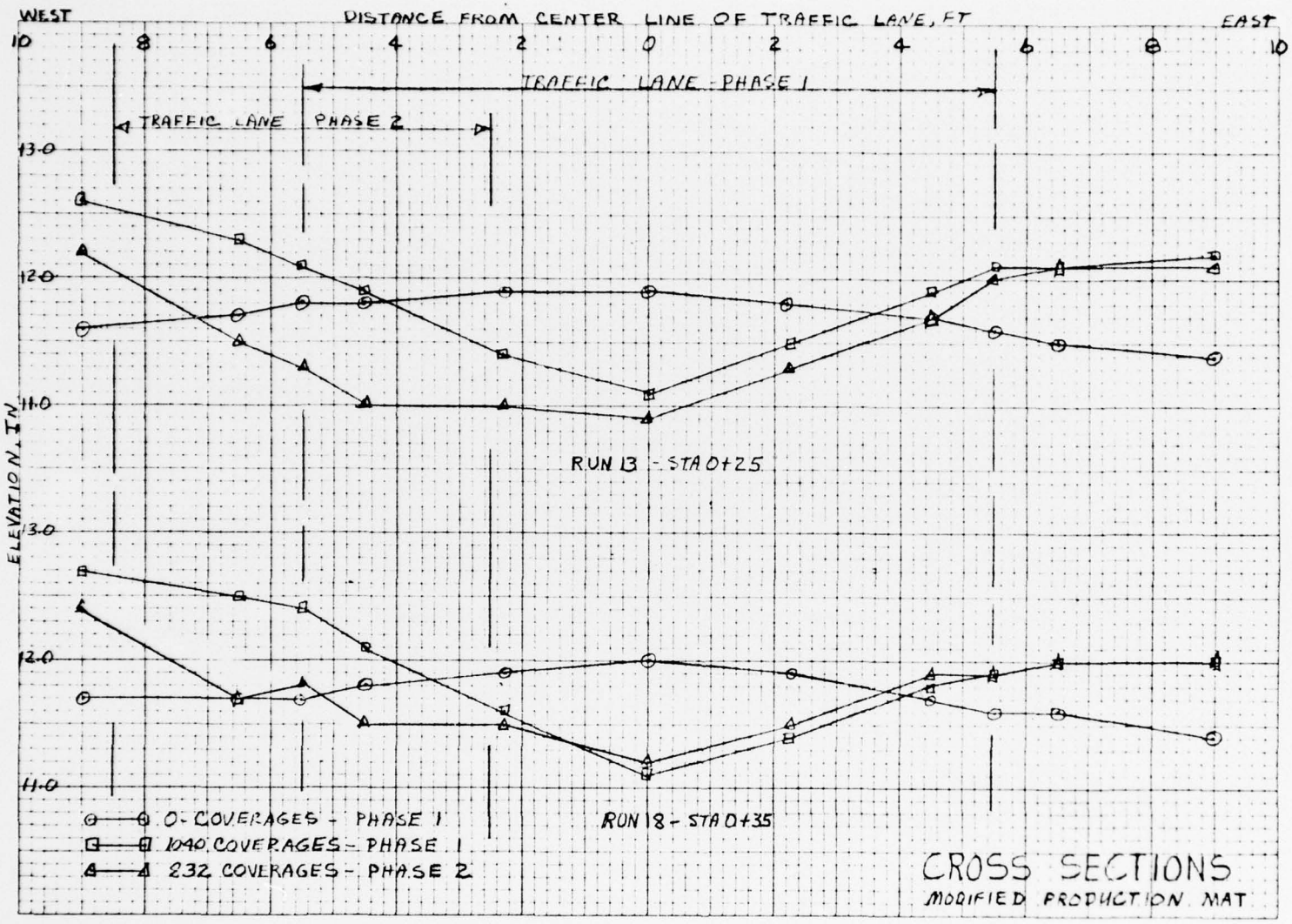
CROSS SECTIONS
INITIAL PRODUCTION MAT

Tucl 85

Incl 86

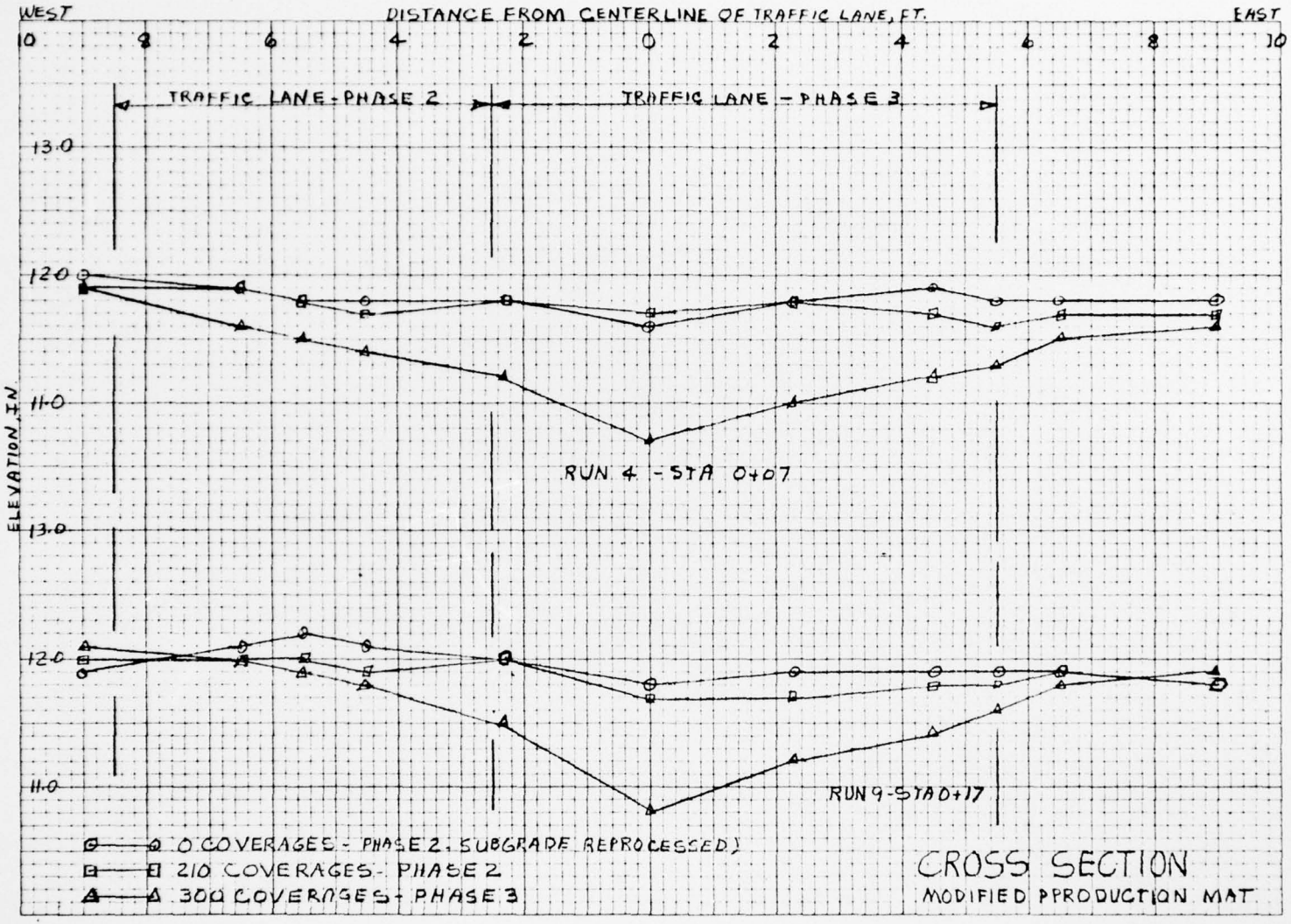


CROSS SECTIONS
MODIFIED PRODUCTION MAT

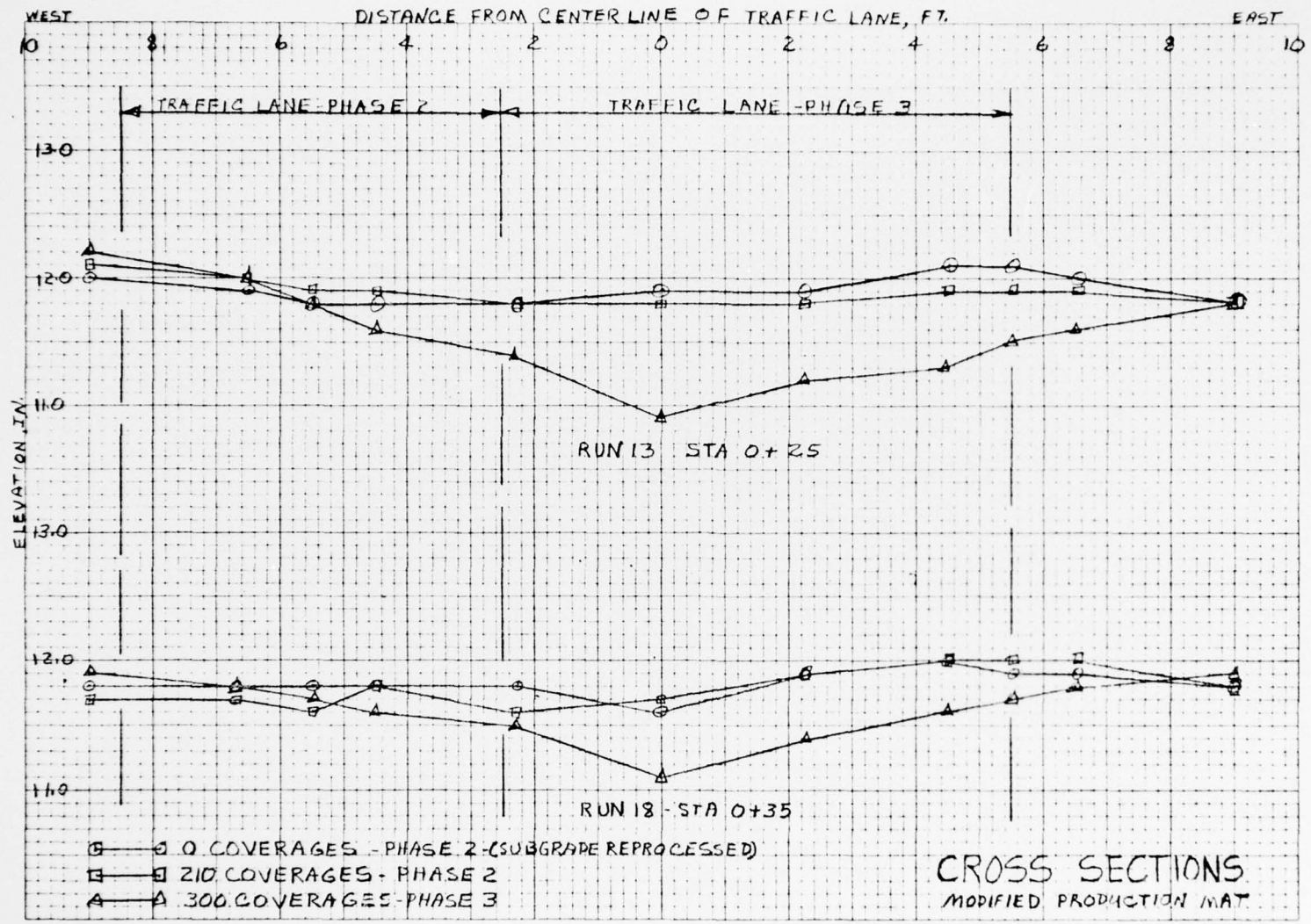


CROSS SECTIONS
MODIFIED PRODUCTION MAT

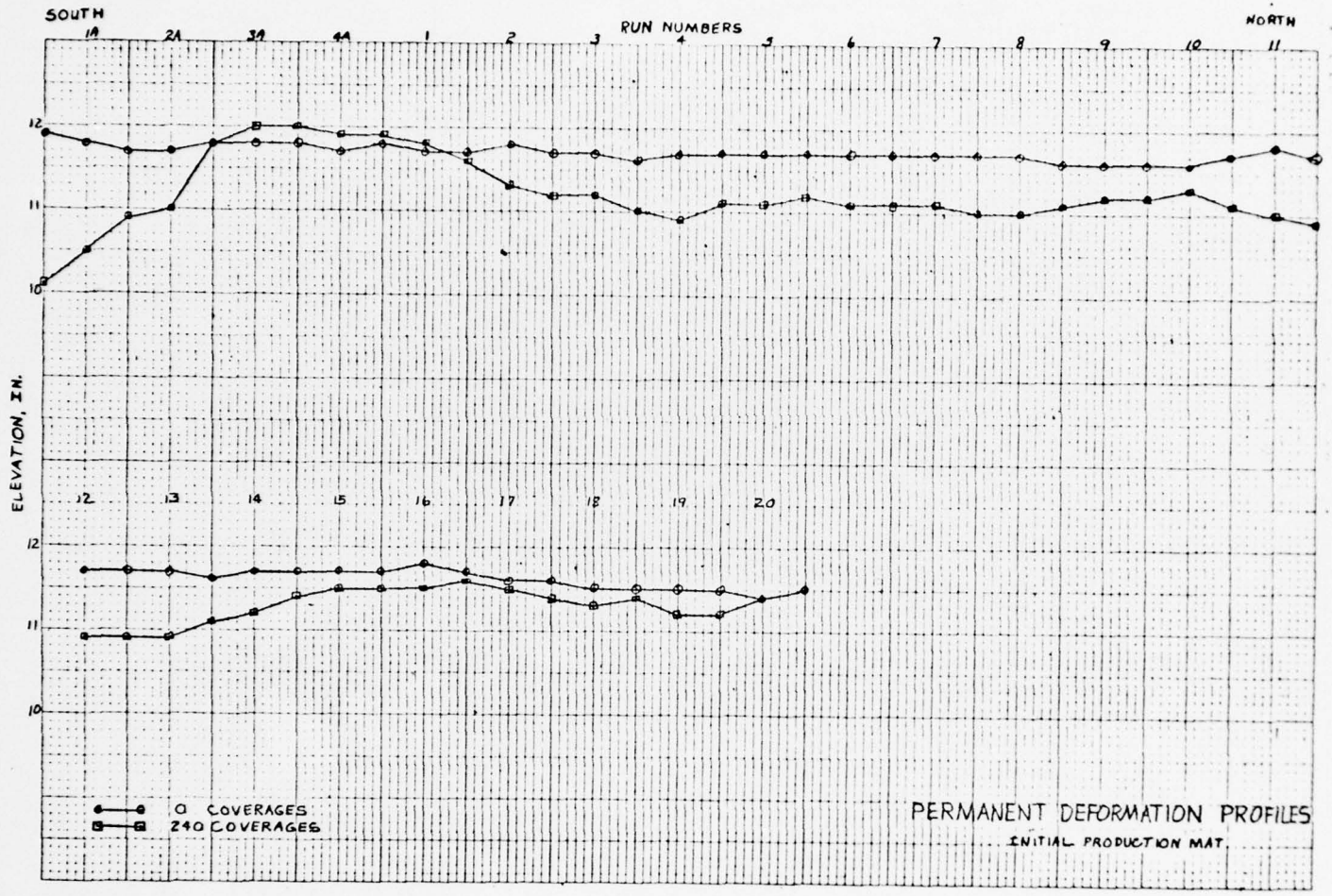
Incl 85

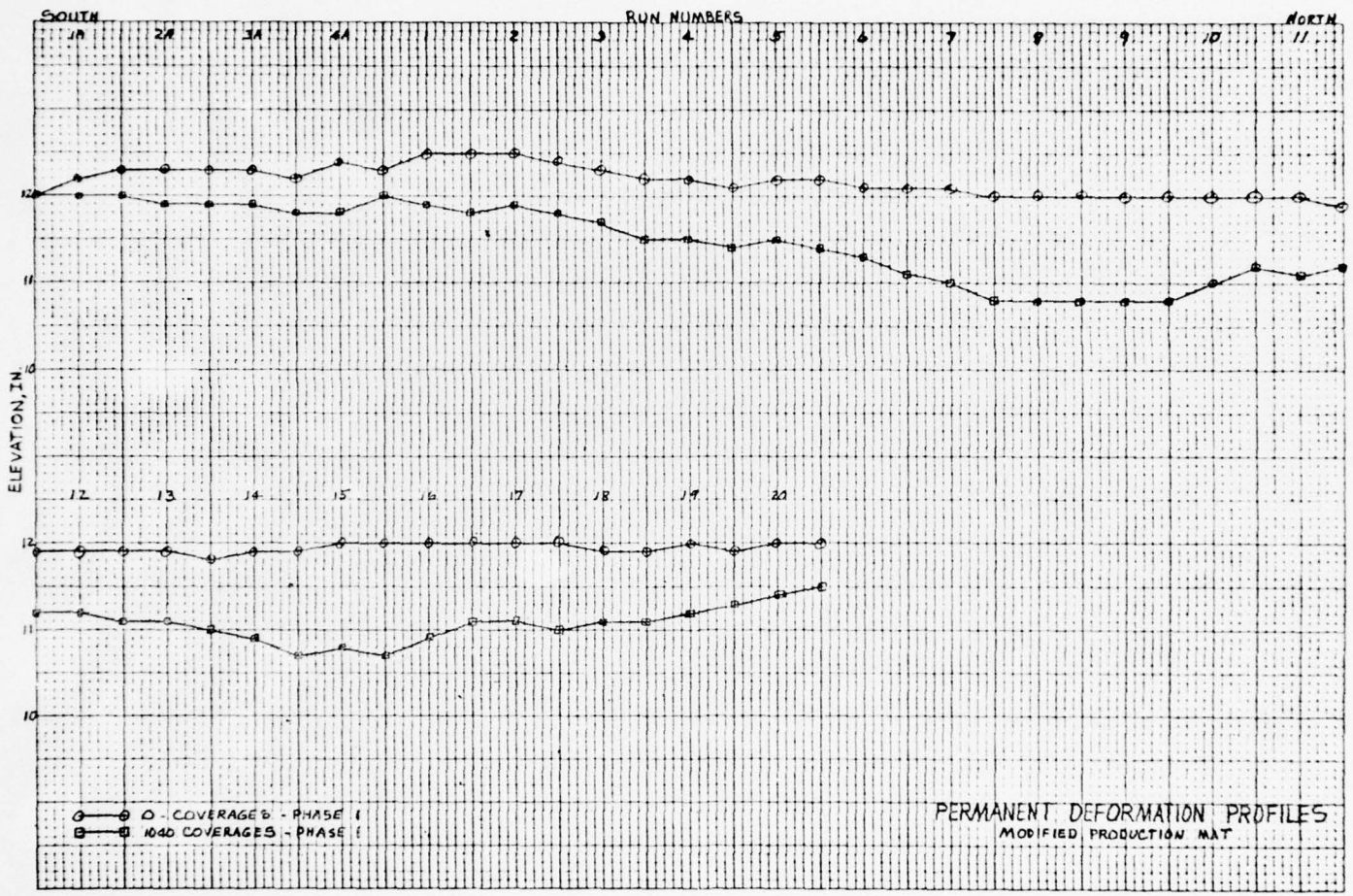


CROSS SECTION
MODIFIED PPRODUCTION MAT

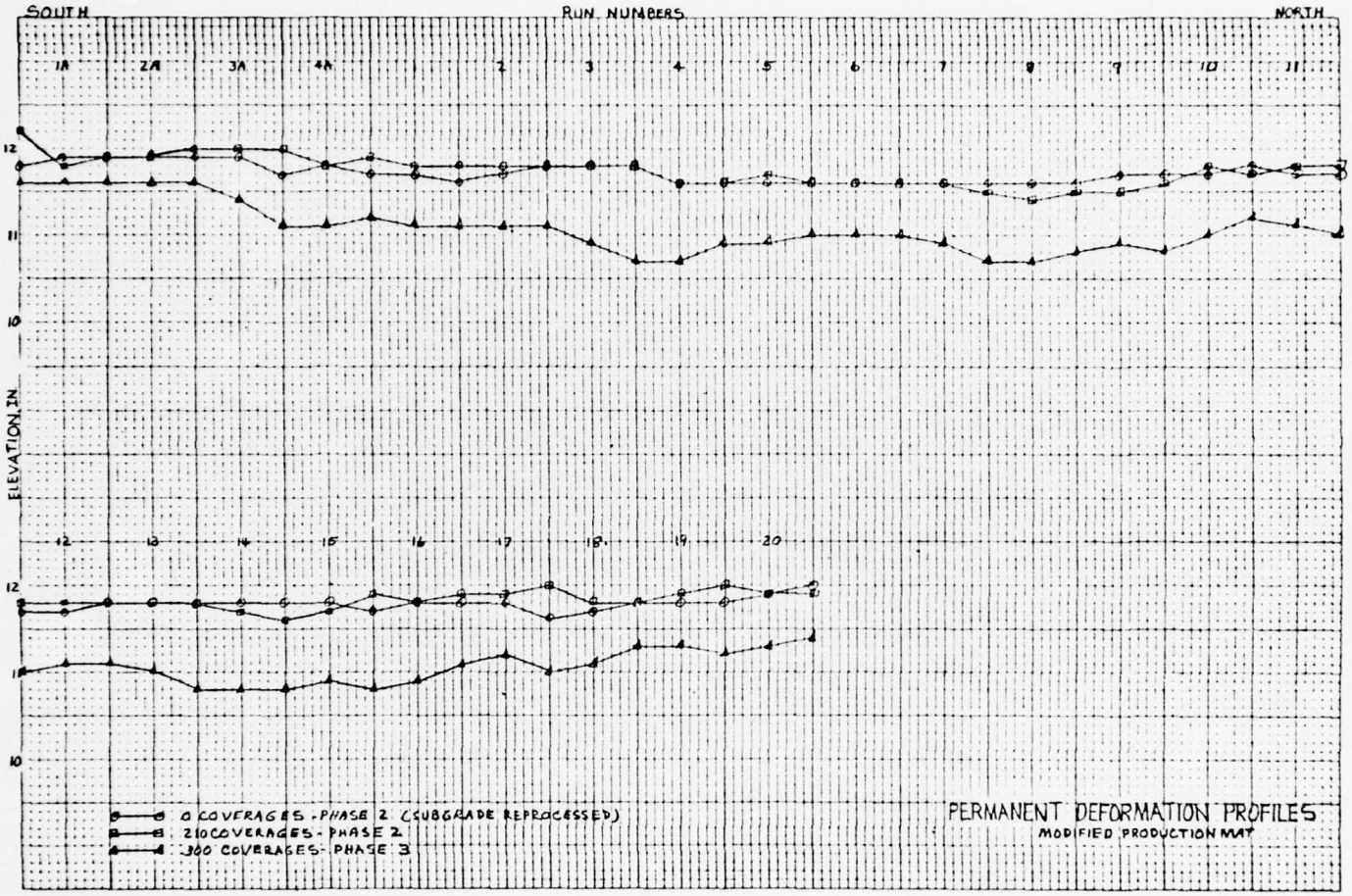


Incl 86


SOUTH
NORTH
RUN NUMBERS
1A
2A
3A
4A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
ELEVATION, IN.
0 COVERAGES
240 COVERAGES
PERMANENT DEFORMATION PROFILES
INITIAL PRODUCTION MAT.


SOUTH
RUN NUMBERS
NORTH
1A
2A
3A
4A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
ELEVATION, IN.
12
11
10
12
11
10
0 - COVERAGES - PHASE I
1040 COVERAGES - PHASE I
PERMANENT DEFORMATION PROFILES
MODIFIED PRODUCTION MAT

Incl 88


SOUTH
RUN NUMBERS
NORTH
1A
2A
3A
4A
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
ELEVATION IN
12
11
10
12
11
10
0 COVERAGES - PHASE 2 (SUBGRADE REPROCESSED)
210 COVERAGES - PHASE 2
300 COVERAGES - PHASE 3
PERMANENT DEFORMATION PROFILES
MODIFIED PRODUCTION MAT

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13. ABSTRACT
The investigation reported herein was conducted to evaluate 2- by 9-ft, truss-web, heavy-duty landing mat supplied by the Dow Chemical Company. The mat was traffic-tested to evaluate its performance relative to the requirement that heavy-duty landing mat be capable of sustaining 1000 coverages of heavy-duty loading (50,000-lb, single-wheel load (SWL), 250-psi tire inflation pressure) when placed on a 4-CBR subgrade. Traffic tests were conducted to determine the performance of the truss-web mat. These traffic tests were conducted on prepared subgrades, with a rolling wheel load simulating actual aircraft conditions. A 50,000-lb SWL with a 250-psi tire inflation pressure was used. The first quantity of mat tested was designated initial production mat. This mat failed after 240 coverages due to tire hazards caused by splits which began at the female I-lock corners and extended along the female connectors. The subgrade was rated at 4.0 CBR. Several design modifications were studied, resulting in tapering of the female connectors at the panel corners. This consisted of cutting the corners of the female connectors off for approximately 2 in. along the connector at an angle with the panel corners. The contractor modified sufficient panels with the tapered corners for a traffic test in an effort to improve the performance of the mat. This traffic test, designated modified production test, was conducted under the same loading conditions used for the initial test. In the first phase of this test, the mat was placed on a subgrade rated at 4.0 CBR and subjected to 1040 coverages without test section failure. In addition to this traffic, two additional phases of traffic were applied prior to mat test section failure. Phase 2 consisted of traffic conducted for the Aberdeen Proving Ground (APG, the agency responsible for engineering tests of heavy-duty landing mat). Since only one line of panel end joints in the standard traffic lane received 100 percent of the traffic coverages, APG requested that an additional line of panel end joints be subjected to 100 percent traffic coverage. Therefore, traffic was applied to achieve 1000 coverages on an additional line of panel end joints, and the mat successfully sustained these coverages on a subgrade rated at 4.0 CBR. Phase 3 traffic was a continuation of Phase 1 traffic until mat failure. A total of 300 additional coverages were applied to the mat on a subgrade with a CBR of 3.9 (equivalent to 336 coverages on a subgrade rated at 4.0 CBR). Therefore, it was determined that the mat will withstand 1376 coverages when placed on a 4-CBR subgrade (1040 plus 336 coverages). Skid tests conducted on this mat resulted in values for the coefficient of friction on wet (0.40) and dry (0.62) surfaces that meet the requirements of the revised Qualitative Materiel Requirement (runway condition reading of 13-25 or coefficient of friction of 0.40 to 0.80). Tensile strength was within specified requirements as revealed by laboratory tensile tests of mat panel samples.

DD FORM 1 NOV 65 1473 REPLACES DD FORM 1473, 1 JAN 64, WHICH IS OBSOLETE FOR ARMY USE.

Unclassified

Security Classification

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Landing mats						
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In accordance with ER 70-2-3, paragraph 6c(1)(b), dated 15 February 1973, a facsimile catalog card in Library of Congress format is reproduced below.

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